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A HISTORY

OF

EPIDEMICS IN BRITAIN.

BY

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V.2, Pt.2

VOLUME II.

From the Extinction of Plague to the present time.

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The case of Queen Mary was one of discrete smallpox turning to the haemorrhagic form; and it had from first to last the most striking resemblance to that of her uncle, the Duke of Gloucester, in September, 1660[1]. The smallpox, says Burnet, came out, but the pustules "sunk so that there was no hope of raising them"; and in sinking they turned to livid spots or blotches. It is quite possible that the repeated doses of Venice treacle at the outset, which failed in their usual effect of inducing sweat, may have had something to do with the result, as Dr Harris certainly believed and afterwards publicly said with the leave of his superiors. But the queen, with eminent qualities of mind and heart, was not physically of good constitution. She was one of those children of James II. whom Willis had brusquely pronounced, some twenty-five years before, to be affected with *mala stamina vitae*; and her father's brother, the Duke of Gloucester, who was not treated in the same way, and, by one account, not treated at all, died in exactly the same kind of haemorrhagic smallpox[2].

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[1] See p. 438.

[2] Macaulay hardly realized the anomalous character of the queen's attack of smallpox. "The physicians," he says, "contradicted each other and themselves in a way which sufficiently indicates the state of medical science in that day. The disease was measles; it was scarlet fever; it was spotted fever; it was erysipelas...Radcliffe's opinion proved to be right." There had been some doubt on the first appearance of the eruption whether it would turn to measles or smallpox. Sydenham says that it was often difficult to make the diagnosis at that stage, and in the queen's case the first signs were anomalous as well. Next day, however, the eruption all over the body became "smallpox in its proper and distinct form." But it did not long remain so; the livid spots, into which the pustules subsided, again raised doubts in the minds of some of the physicians whether it was not measles after all; and there was undoubtedly erysipelas of the face. Harris took the middle course of diagnosing "smallpox and measles mingled," a name by which the form that we now call haemorrhagic smallpox had been known from the early part of the seventeenth century. It was at this late and ominous stage of the illness that Radcliffe was called in; it is not correct to say, as the historian says, that he was the first to pronounce "the more alarming name of smallpox." The diagnosis was then a matter of little moment, for the queen was dying. He declared that "her majesty was a dead woman, for it was impossible to do any good in her case when remedies had been given that were so contrary to the nature of her distemper; yet he would endeavour to do all that lay in his power to give her ease." (Munk's *Roll of the College of Physicians*, II. 458.) For some unexplained reason Radcliffe was made to bear the blame of the queen's death, an accusation which he deserved as little as he deserved the credit given him by the historian of having been the only physician to make the correct diagnosis.

Macaulay is equally unfortunate in his remark that smallpox "was then the most terrible of all the ministers of death," in his comparison of it to plague, and in his rhetoric generally. The haemorrhagic form, of which the queen died, was rare. Dover adds it as a fourth variety, but admits that he had seen only five cases of it. Ferguson, of Aberdeen, as late as 1808, in a paper on measles (*Med. and Phys. Journal*, XXI. 359), described a haemorrhagic case of smallpox which he once saw, without knowing that it was a recognized variety of smallpox at all. However terrible a minister of death smallpox may sometimes have been, it happened that there was

Circumstances of the great Epidemic in 1710.

For fifteen years after the year of Queen Mary's death by haemorrhagic smallpox, there was comparatively little of the disease in London. In seven of the years the deaths were counted by hundreds, while the average of the whole period from 1695 to 1710, which included the years of Marlborough's campaigns, was unaccountably low. There was a corresponding lull in the fever mortality in London; and as precisely the same kind of lull took place both in fever and smallpox during the next great war with France a century after, it may seem as if a state of war, instead of spreading infectious disease as it did in the countries where the war raged, had the effect in England of reducing it. The period of comparative immunity came to an end, both for fever and smallpox, with the great epidemic of each disease in 1710, in which year smallpox cut off 3138 in London and "great numbers in Norwich[1]." In 1714 there was another severe epidemic of smallpox in London, again in company with one of fever, and thereafter a high average for many years.

Smallpox deaths in London, 1701–1720.

Year	Deaths from smallpox	Deaths from all causes
1701	1099	20,471
1702	311	19,481
1703	398	20,720
1704	1501	22,684
1705	1095	22,097
1706	721	19,847
1707	1078	21,600
1708	1687	21,291
1709	1024	21,800
1710	3138	24,620
1711	915	19,833
1712	1943	21,198
1713	1614	21,057
1714	2810	26,589
1715	1057	22,232
1716	2427	24,436
1717	2211	23,446
1718	1884	26,523
1719	3229	28,347
1720	1442	25,454

The marked increase of smallpox deaths in 1710 and 1714, after an interval of low or moderate annual mortalities, caused

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comparatively little of it in London during the period covered by Macaulay's history; and it certainly did not "fill the churchyards," as he might have found out by referring to that not altogether recondite source, the bills of mortality. From 1694 to 1700 fevers caused three and a half times more deaths than smallpox. In the year 1696, when "the distress of the common people was severe," the smallpox deaths in London were 196, or about one-hundredth part of the mortality from all causes.

[1] Blomefield, III. 432. The following are two cases from the London epidemic of 1710: June, 15.—"Lord Ashburnham's brother has the smallpox, and the first, concluding he had had it, went to him, and now himself very ill of them. Doctor Garth, who says none has them twice, examined the servants, and they tell him he was but six days ill then; so he concludes that was not the smallpox." *Cal. Belvoir MSS.*, II. 190.

the same cry to be raised as in the Restoration period, namely, that the medical treatment was to blame. Lynn, writing in 1714, says that many complaints were made of the destructiveness of smallpox in the epidemic four years before (1710), and of "the great want of better help, care or advice therein[1]." Woodward also ascribed the great increase of smallpox fatalities from 1710 onwards to erroneous treatment[2]. All the lives that might have been saved by better medical treatment or by more assiduous visiting of the sick would, in the then circumstances of the London populace, have made little difference to the bills of mortality. The causes that made fever so mortal in the same years were in great part the causes that made smallpox mortal, the former chiefly among those in the prime or maturity of life, the latter chiefly among the children. London had nearly reached its maximum of overcrowding; its population advanced but little for a good many years, and its mortality from all causes was so great that the numbers were only kept up by a constant recruit from the country. The necessity of doing something for the health of the poorer classes was felt, but nothing adequate was done or could be done[3]. So far as concerned the richer classes, they incurred constant danger of smallpox infection. In one of those fatal years, probably 1720, when there was smallpox among persons of quality in London, the Duchess of Argyll wrote to the Countess of Bute, to congratulate her on the birth of a daughter and on having two fine boys in her family already, "and he that has had the smallpox as good as two, so mortal as that distemper has been this year in town was never known[4]."

The domestics also of great houses frequently caught

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[1] Lynn, u. s. He recalls a remark made by a writer in 1710 that the severity of that epidemic "was not due to a peculiar state of the air, but to a defect in some of our great physicians, who, being too fully employed, could not give due attendance to all or even to any of their patients through the multiplicity of them: for want of which, and the severity of their injunctions, which hindered others from applying anything in their absence, many persons were lost who might otherwise have been saved with due care."

[2] John Woodward, M.D., *The State of Physick and Diseases, with an inquiry into the causes of the late increase of them, but more particularly of the Smallpox; with some considerations on the new practice of purging in that disease.* London, 1718.

[3] See the account of the Dispensary of the College of Physicians in Warwick Lane, in Munk's *Roll of the Coll. of Phys.* II. 499, under the head of Sir Samuel Garth. The dispensary was started in 1687 and languished until 1724. The General Dispensary in Aldersgate Street was opened in 1770 with Dr Hulme as physician, and Dr Lettsom as additional physician in 1773.

[4] Letter of 27 March, year not given. *Hist. MSS. Com.* V. 618. See also the letter of 4 March, 1720, from Mangey to Waller, cited above, p. 450.

smallpox and spread it, a trouble which gave occasion at length, in 1746, to the first Smallpox Hospital for the admission of such of them as brought subscribers' letters. Before that it had been the practice of the rich to send their domestics to private houses kept by nurses[1].

It was in these circumstances, and for the benefit of the upper classes and their domestics, that a project of getting through smallpox on easy terms was brought to the notice of London society in 1721.

Inoculation brought into England.

The first that was heard in England of engrafting the smallpox was through a communication by Dr Timoni, a Greek of Constantinople, to Dr Woodward, Gresham professor of physic, who had the paper printed in the *Philosophical Transactions* of the Royal Society[2]. After a statement that "the Circassians, Georgians and other Asiatics" had brought the practice to Constantinople, and that it had been followed there for forty years by "the Turks and others" (statements never confirmed but on inquiry contradicted by those who knew), he proceeds to matters more within his own competence. During these eight years past "thousands" of subjects have been inoculated, and the value of the practice has now been put beyond all suspicion and doubt. The practice is to take fluid smallpox matter from the pustules of a discrete case of the natural disease, and convey it warm in a stopped phial to the scene of inoculation. A few punctures with a three-edged surgeon's needle are made in any of the fleshy parts (but preferably over the muscles of the arm or forearm) until the

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[1] Dr Philip Rose, of Bedfordbury ("over against a baker, next door to the Old Black Horse, two doors from Chandos Street, St Martin's parish"), having been called by Lady Wyche to see her butler, pronounced him to be in the smallpox; whereupon the lady informed the physician that "she knew an eminent nurse who had managed above twenty of my Lord Cheyney's servants in the smallpox, and every one of them had recovered." Her butler was accordingly carried to this nurse's house in a by street near Swallow Street. *An Essay on the Smallpox.* By Philip Rose, M.D. Lond. 1724, p. 18.

[2] "An Account or History of the Procuring the Small Pox by Incision, or Inoculation; as it has for some time been practised at Constantinople." Being the Extract of a Letter from Emanuel Timonius, Oxon. et Patav. M.D., S.R.S., dated at Constantinople, December, 1713. Communicated to *Phil. Trans.* XXIX. (Jan.–March, 1714) 72, by Dr Woodward, Gresham Professor of Physic. Timoni had been in England in 1703, and had been incorporated a doctor of medicine at Oxford on his Padua degree: hence, perhaps, his correspondence.

blood comes; a drop of the fluid matter of smallpox is then to be mixed with the blood, and the inoculated part to be protected by a walnut shell bound over it. The symptoms that follow are very slight, some being scarce sensible that they are ill. The pocks that ensue are for the most part distinct, few, and scattered; commonly ten or twenty break out; now and then the patient may have only two or three; few have a hundred. The matter is hardly a thick pus, as in the common sort, but a thinner kind of *sanies.* There are some in whom no pustules appear except at the points of insertion, where purulent tubercles arise; yet these have never had the smallpox afterwards in their whole lives, though they have consorted with persons having it. On one occasion fifty were inoculated together, and of these four developed smallpox which was nearly confluent; but there was a suspicion that they must have been already infected by contagion. Timoni had never observed any mischievous accident from this incision hitherto; reports of such had sometimes spread abroad among the vulgar, "yet having gone on purpose to the houses whence such rumours have arisen I have found the whole to be absolutely false." But, to keep nothing back, he will mention two fatalities of children inoculated; both of them were cases of hereditary *lues* with marasmus, and it was about the fortieth day from their inoculation that death ensued. The rest of Timoni's paper is printed in the original Latin, being devoted to a theory of engrafting which afterwards passed current:—one attack of smallpox secures from a second, a mild attack serves as well as a severe, as also in the natural way, the reason being that smallpox, in whatever degree, causes a fermentation of the mass of the blood.

A year after this, in 1715, there was published in London *An Essay on External Remedies*, of which the 37th chapter was "Of the Variolae or Small Pox, the manner of ingrafting or giving them, and of their Cure." The author was Peter Kennedy, Chir. Med., a Scot of good but impoverished family, who had spent several years in various parts of Europe visiting the schools of medicine and surgery, and had found his way to Constantinople[2]. His account of the engrafting of smallpox,

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[1] *An Essay on External Remedies*, Lond. 1715, p. 153. Kennedy settled in practice in London as an ophthalmic surgeon, and appears to have enjoyed the patronage of Arbuthnot. His other work, *Ophthalmographia, or Treatise of the Eye*

which he had seen or heard of there, differs somewhat from that of Timoni, whom he just refers to: "Dr Timoni, a Grecian who resides there, had taken or followed this same method with his two sisters a little before my arrival at Constantinople."

Kennedy says that engrafting the smallpox was practised in the Peloponnesus or Morea, "and at this present time is very much used both in Turkey and Persia, where they give it in order to prevent its more severe effects by the early knowledge of its coming; as also probably to prevent them being troubled with it a second time." In Persia, however, the smallpox was taken internally in a dose of dried powder. In Constantinople the matter was inserted at scarifications upon the forehead, wrists, and ankles. After eight or ten days the smallpox came forward in a kindly manner, and not nearly so numerous as if naturally taken. "The greatest objection commonly proposed is, whether or not it hinders the patient from being infected a second time. But, in answer to this, it is advanced that we do rarely or never find any to have been troubled with this distemper twice in the same manner or the same fulness of malignity"—i.e. we rarely find this in the natural way.

Kennedy's object was, not to recommend the engrafting of smallpox in England, but to show how easily distempers or contagions, "as well as medicines," may be communicated to the blood from the surface of the body: "and this is more confirmed by some of the country people in Italy, in the more remote parts from towns, so also in some parts of the highlands of Scotland, where they infect their children by rubbing them with a kindly pock, as they term it."

Meanwhile Timoni's essay in the *Philosophical Transactions* had stirred up Sir Hans Sloane to make farther inquiries[1]. He applied to the British consul at Smyrna, Dr Sherrard, who was fortunately able to get information at first hand from an old Smyrna colleague, Dr Pylarini, consul for Venice, who had practised inoculation at Constantinople in the first years of the century. Pylarini, who had retired to Venice, was induced to draw up an account of what he knew of the beginnings and

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and its Diseases, with appendix on Diseases of the Ear, Lond. 1723, which is dedicated to Arbuthnot, shows a knowledge of optics and of the structure of the parts concerned in operations on the eye.

[1] Sloane, *Phil. Trans.* XLIX. (1756), p. 516, "An Account of Inoculation given to Mr Ranby to be published, anno 1736."

original methods of engrafting, which was printed at Venice, with a dedication to Sherrard, in 1715, and at once copied into the *Philosophical Transactions*[1]. This, the most trustworthy account of the Constantinople practice, ignores the earlier essay of Timoni altogether.

Pylarini carries the authentic history of the practice at Constantinople back to the year 1701. Its history before that was obscure; but it is most certain, he says, that it began in Greece, more particularly in Thessaly, and crept gradually from place to place until it reached Constantinople, where it attracted little notice for several years, being rarely practised and only among the lower class. A noble Greek having spoken of it to him in 1701, with a view to the protection of his children from the epidemic then raging, Pylarini had to confess his entire ignorance of it, but being at the Greek's house four days after he there met a Greek woman who expounded the practice clearly in detail and gave him many instances of persons who had gone through it safely. Pylarini inquired into some of these cases and found them to be genuine; but in that great city he could not search them all out. Soon after this interview, the woman came and operated on the four children of the rich Greek, of whom the three younger had a very mild disease, but the eldest a severe attack, which nearly cost her life. Many other rich Greek families followed suit, so that, says Pylarini in 1715, "every one wishes to have the advantage of transplantation." He adds, however, that "the Turks have hitherto neglected it." He confirms Timoni in saying that the pocks raised by transplantation were nearly always of the distinct kind and few in number—ten to twenty or thirty, rarely a hundred, very rarely two hundred,—although he does not reach Timoni's minimum of "two or three," or the pustules only at the punctured spots.

These accounts from Constantinople, printed in London in 1714, 1715 and 1716 were regarded, says Douglass, "as virtuoso amusements[2]" until the spring of 1721, when inoculation began to be tried tentatively in London, and in a bold and

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[1] Jacobus Pylarinus, *Nova et Tuta Variolas excitandi per Transplantationem Methodus, nuper inventa et in usum tracta, qua rite peracta immunia in posterum praeservantur ab hujusmodi contagio corpora.* Venetiis, 1715. Privilege dated 10 Nov., 1715. Reprinted in *Phil. Trans.* XXIX. (Jan.–March, 1716), p. 393.

[2] *A Dissertation concerning Inoculation of Smallpox.* By W. D[ouglass], Boston, 1730.

confident way during the very same weeks at Boston, New England.

Dr Pitcairn, of Edinburgh, had received an account of inoculation from Bellini, an Italian physician, who had read Pylarini's essay. Douglass says that Pitcairn "was very fond of it, but could not persuade himself to venture it in practice[1]." Sometime in March, 1721, one à Castro had issued in London a pamphlet on inoculation, full of inaccuracies and of no moment[2]. In a lecture on the plague given at the College of Physicians on the 17th of April, 1721, Dr Walter Harris made a passing reference to the Constantinople practice of engrafting smallpox[3]; and shortly after that, or shortly before, the Lady Mary Wortley Montagu set about having her younger child inoculated in London, her elder child having been inoculated at Constantinople three or four years before. This lady had, in 1717, accompanied her husband as ambassador to the Porte, where the embassy remained about a year. During her residence at Pera she heard of the Greek practice of engrafting or transplanting the smallpox; the French ambassador had said in pleasantry to her: "They take the smallpox here by way of diversion, as they take the waters in other countries." According to her information, there was a set of old women who made it their business to perform the operation every autumn, in the month of September, when the great heat is abated. People send to one another to know if any of their family has a mind to have the smallpox; they make parties for this purpose, and when they are met (commonly fifteen or sixteen together) the old woman comes with a nut-shell full of matter. Every year thousands undergo the operation (but according to the information of the British embassy in 1755 not more than twenty in a year, which may perhaps mean that it had fallen into disuse[4]). There is no example of anyone that has died of it. She intended to have it performed upon her little son, and had patriotic visions of bringing "this useful invention" into fashion in England. Accordingly her boy, aged five, was inoculated in March, $17\frac{17}{18}$, by a Greek woman, under the direction of Maitland, a Scots surgeon who attended the embassy. The child suffered very

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[1] *loc. cit.*

[2] Published under the initials J. C., M.D.

[3] *De Peste dissertatio habita Apr.* 17, 1721, *cui accessit descriptio inoculationis Variolarum*, a Gualt. Harris, Lond. 1721.

[4] *Phil. Trans.* XLIX. 104.

little inconvenience and, according to Maitland, "had about an hundred pox all upon his body."

Lady Mary returned to London in 1718; but it was not until some three years after, in the spring of 1721, that she stirred the matter again. Whether it was that she herself was the cause of the talk about inoculation in London in April, 1721, or that she merely had the subject brought back to her mind by the essay of à Castro, the lecture by Harris, or by what others were saying, she sent sometime in April for Maitland, who had assisted at the inoculation of her elder child at Pera, with a view to having the operation done on the younger, who was now four or five years old. In a week or two Maitland found suitable smallpox matter and engrafted the child on both arms; on the tenth night she was a little feverish, but the smallpox began to appear next morning and in a few days she was perfectly recovered. Three physicians of the College visited the case, as well as several ladies and other persons of distinction. One of those physicians, Dr Keith, resolved to have a boy of his own, aged six, engrafted, which was done by Maitland on both arms on the 11th of May, 1721, five ounces of blood having been drawn before the operation.

Among Lady Mary's intimates was the Princess of Wales, who became interested in the project for the sake of her own children[1]. She proposed to the king (George I.) that he should remit the capital sentence of six Newgate felons on condition that they would submit to be inoculated. The king consulted Sir Hans Sloane, who applied to Dr Terry of Enfield, formerly in practice at Constantinople. Terry's report was that not more than one in eight hundred had died from the effects of inoculation in Turkey. The upshot was that the six Newgate convicts, three men and three women, were inoculated by Maitland on the 9th of August, 1721, in the presence of several eminent physicians, surgeons, Turkey merchants, and others. The matter was inserted on both arms and on the right leg of each, and the insertion was repeated on the arms of five of them three days after. Dr Mead, having heard that the Chinese procured smallpox by stuffing the matter up their noses, got a pardon for a seventh convict under sentence of death, a young woman, on condition that she would submit to a pledget of cotton dipped in smallpox matter being inserted in her nostril:

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[1] Sloane, u. s., 1736.

it produced, besides a fair smallpox, much severe pain along the Schneiderian membrane and the frontal sinuses, and was not thought a satisfactory experiment. The trial upon the other six was reassuring; they all escaped with the slightest possible eruption; "the most that anyone had was sixty pustules."

The next step was on the part of the Princess of Wales, who procured the inoculation of six charity children of the parish of St James's. Four of them had smallpox "very favourably"; one did not have it at all, "having evidently had the smallpox before"; and the sixth had not only the prolonged effects of inoculation, but also an attack of the natural smallpox, of a favourable kind, eleven weeks after. This experiment was followed by the inoculation of five more hospital children, from eight to fourteen weeks old, of whom three had no effects, their bodies being "morbid." The Princess of Wales was at length resolved in April, 1722, to run the risk of the operation on her two daughters, the princess Amelia, aged eleven, and the princess Caroline, aged nine, being urged by the fact that another daughter, the princess Anne, afterwards princess royal of Orange, had just had the natural smallpox so dangerously that Sloane feared for her life. The inoculations were done on the 19th of April, by serjeant-surgeon Amyand under the direction of Sir Hans Sloane. What passed between that physician and the king shows at once the apprehension of danger from a novel operation and the temper in which it was undertaken:

> "I told his Majesty," says Sloane, "that it was impossible to be certain but that, raising such a commotion in the blood, there might happen dangerous accidents not foreseen; but he replied that such might, and had happened, to persons who had lost their lives by bleeding in a pleurisy, and taking physic in any distemper, let never so much care be taken. I told his Majesty that I thought this to be the same case; and the matter was concluded upon, and succeeded as usual, without any danger during the operation, or the least ill symptom or disorder since."

The news of the successful inoculation of the two princesses had hardly time to create a vogue for the practice, when there came word, in the same month of April, of the death by inoculation of the Earl of Sunderland's son, aged two and a half, and of Lord Bathurst's footman, aged nineteen.

Meanwhile, in the autumn of 1721, Maitland had gone down to Hertford, where smallpox would seem to have been more rife than elsewhere, and had done several inoculations. In the

family of a Quaker, near Hertford, an infant of two and a half years developed no more than twenty pustules, which lasted only three or four days; but six domestics of the house, four men and two maids, "who all in their turn were wont to hug and caress this child whilst under the operation and the pustules were out upon her" (Maitland), caught natural smallpox in varying degrees of severity, some of them having a narrow escape, while one of the maids died.

The question that people were really anxious about was the immediate risk to the inoculated; and as there were occasional fatalities, especially to the age of childhood, inoculation made little progress. In the first year of its trial in England it was done on the greatest scale by Dr Nettleton, of Halifax, whose practice remains for more particular notice. Apart from his cases, which numbered sixty-one, the following are all that were known in England from the month of April, 1721, to the end of 1722[1]:

By Mr Amyand, surgeon, London	17
„ Mr Maitland, surgeon, London and elsewhere	57
„ Dr Dover, London	4
„ Mr Weymish, London	3
„ Rev. Mr Johnson, London	3
„ Dr Brady, Portsmouth	4
„ Messrs Smith and Dymes, Chichester	13
„ Mr Waller, Gosport	3
„ A woman at Leicester	8
„ Dr Williams, Haverfordwest	6
„ Two others near Haverfordwest	2
„ Dr French, Bristol	1

The inoculations in all England in 1723 reached the considerable total of 292; but in 1724 they were no more than 40, being distributed among the various operators as follows:

Amyand, London	11
Maitland, London	4
Pemberton, London	3
Cheselden, London	1
Pawlett, London	1
Howman and Offley, Norwich	3
Beeston, Ipswich	3
Lake, Sevenoaks	3
Goodwin, Winchester	1
Mrs Ringe, Shaftesbury	2
Skinner, Ottery St Mary	6
Tolcher, Plymouth	2

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[1] Jurin, *Account of the Success of Inoculating the Smallpox.* Annual reports from 1723 to 1726.

In the next two years, 1725–26, Amyand and Maitland had respectively 66 and 37 cases in London, the other known cases in London being 30. Maitland had also 16 cases in Scotland. Sir Thomas Lyttelton had 4 at Hagley. All the known cases in those two years, including Nettleton's at Halifax, came to 256, with four deaths of somewhat conspicuous persons. In 1727 the inoculations fell to 87, and in 1728 to 37. The total in eight years was 897, with 17 deaths. For the next ten or twelve years none were heard of in Britain. The check, however, was only temporary. The practice revived, extended among the rich, at length reached the common people in some counties, and gave rise to important developments of scientific doctrine. The greater these developments the more interesting the origins, which we shall now examine.

The popular Origins of Inoculation.

Six years before the Greek inoculation was tried in London, Kennedy, the travelled Scot, had compared the Constantinople practice with one that he knew of in his native country: "So also in some parts of the highlands of Scotland they infect their children by rubbing them with a kindly pock." This indigenous Scots practice was confirmed by Professor Monro, the first, of Edinburgh, in 1765:

> "When the smallpox appears favourable in one child of a family, the parents generally allow commerce of their other children with the one in the disease; nay, I am assured that in some of the remote highland parts of this country it has been an old practice of parents whose children have not had the smallpox to watch for an opportunity of some child having a good mild smallpox, that they may communicate the disease to their own children by making them bedfellows to those in it, and by tying worsted threads wet with the pocky matter round their wrists."

And, to make it clear that this was not the same as the method afterwards used of procuring the smallpox, he adds that the latter was not known in Scotland until Maitland introduced it, in 1726[1]. In Wales the curious practice of buying the smallpox was found to be indigenous[2]. One young woman in a village near Milford Haven testified in 1722 that, some eight or nine

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[1] Alexander Monro, primus, *An Account of the Inoculation of the Smallpox in Scotland.* Edin. 1765 (Reply to circular of queries issued by the dean and delegates of the Faculty of Medicine of Paris).

[2] *Phil. Trans.* 1722: papers by Perrot Williams, M.D. (p. 262), and Richard Wright (p. 267).

years before, she had bought twenty pocky scabs of one in the smallpox, and had held them in her hand, with the result that she sickened with the infection in ten or twelve days and had upwards of thirty large pustules in her face and elsewhere—at least ten more than she had bargained for. A schoolboy of Oswestry, who had since become an attorney and must have known the nature of an affidavit, bought, as he positively affirmed, for three-pence of a certain lady twelve pustules of smallpox (at a farthing each), and rubbed the matter into his hand with the back of his pocket-knife; a sore remained on the hand as well as pockpits in his face.

There was nothing remarkable in these methods of procuring smallpox except an occasional element of superstition or freak. It was not unusual in England for educated persons to let smallpox go through all their children after it had attacked one of them, just as it is regarded an economy by many to have done with the measles. On 15 September, 1685, Evelyn travelling to Portsmouth in the company of Pepys, stopped to make a call at Bagshot at the house of Mrs Graham, a former maid of honour to the queen. "Her eldest son was now sick of the smallpox, but in a likely way to recover, and others of her children ran about and among the infected, which she said she let them do on purpose that they might whilst young pass that fatal disease she fancied they were to undergo one time or other, and that this would be for the best." It would be for the best because children from five to ten or fifteen (the older writers said even infants) ran far less risk from the attack than at the higher ages, and seldom died of it.

Similar means of procuring smallpox for children were used in other countries. La Motraye, who rode through the Caucasus in 1712, was told that children, to give them the smallpox, were placed in the same bed with one who had it, the mothers sometimes carrying them a whole day's journey to any village where they heard of someone being attacked. He professes also to have seen a child of four inoculated with smallpox matter at five places (the region of the heart, the pit of the stomach, the navel, the right wrist and the left foot) by an old woman who used "three needles tied together[1]." The idea

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[1] *Voyages du Sr. A. de la Motraye.* Tome II. La Haye, 1727, Chap. III. p. 98. He saw Timoni at Constantinople on his return from the Caucasus. Timoni used "a three-edged surgeon's needle," which is more intelligible than three needles

of barter was widely spread in those practices of procuring smallpox on favourable terms. We have seen that the Welsh had it. Bruce found it in his travels to the sources of the Nile[1]. African negroes are known also to have carried with them to the West Indies the practice of "buying the yaws," which is also a contagious and inoculable disease of the skin. The earliest medical notices of buying the smallpox come from Poland in 1671 and 1677. A case having been published in the *Miscellanea Curiosa* of the Imperial German Academy, in which a quartan ague was alleged to have been got rid of by transferring it to a brute animal, Dr Vollgnad, of Warsaw wrote: "There is a similar superstition not uncommon among our nurses, who instruct the children under their charge to buy for a few farthings a certain number of pocks from one infected with the smallpox, in the belief that those who purchase that disagreeeable commodity will be affected with a more scanty eruption and will be the sooner freed from the disease and with the less risk[2]." Six years after, Dr Simon Schultz, of Thorn, physician

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tied together. La Motraye's travellers' tales have not enjoyed the best credit. But this of the inoculation in Circassia has been made by Voltaire the sole basis of his spirited account of inoculation as the national practice of that country (*Lettres sur les Anglais*, Lettre XI. "Sur l'insertion de la petite-vérole," 1727, reprinted as the article "Inoculation" in his *Dict. Philosophique*, 1764). There has never been a grosser instance of a myth constructed in cold blood. The fable does not need refutation because it is mere assertion, in the manner of a *philosophe*. But the British ambassador at Constantinople made inquiries concerning the alleged Georgian or "Circassian" practice in 1755, at the instance of Maty, the foreign secretary of the Royal Society (*Phil. Trans.* XLIX. 104). A Capuchin friar, "a grave sober man" who had returned shortly before from a sixteen years' residence in Georgia and "gives an account of the virtues and vices, good and evil, of that country with plainness and candour," solemnly declared to Mr Porter that he never heard of inoculation "at Akalsike, Imiritte or Titlis," and was persuaded that it had never been known in the Caucasus. It was impossible that either the public or private practice of inoculation could have been concealed from him, as he went in and out among the people practising physic. He had often attended them in the smallpox, which, he said, was unusually severe there. On the other hand La Motraye says: "I found the Circassians becoming more beautiful as we penetrated into the mountains. As I saw no one marked with the smallpox, it occurred to me to ask if they had any secret to protect them from the ravages which this enemy of beauty makes among all nations. They told me, Yes; and gave me to understand that it was inoculating, or communicating it to those whom they wished to preserve by taking the matter from one who had it and mixing the same with the blood at incisions which they made. On this I resolved to see the operation, if it were possible, and made inquiry in every village that we passed through if there was anyone about to have it done. I soon found an opportunity in a village named Degliad, where I heard that they were going to inoculate a young girl of four or five years old just as we were passing." This was published fifteen years after, Timoni's account being given in an Appendix.

[1] *Travels*, IV. 484. See also for Algiers, *Lond. Med. Journ.* XI. 141. In those cases there was no inoculation by puncture or otherwise.

[2] *Miscell. Curiosa s. Ephemer. Med.-Phys. Acad. Nat. Curios.* Decuria I., An. 2, Obs. CLXV. 1671. D. Thomae Bartholini, "Febris ex Imaginatione." Scholion by D. Henr. Vollgnad, Vratislaviae practicus.

to the king of Poland, wrote that the same practice of buying the smallpox obtained also in that part of Poland: "What I have first to remark," he says, "is that, in most cases if not in all, those infants that buy of the infected (whether in their proper persons or through others), while they may have few pocks, yet fall into a more serious illness than otherwise (*gravius reliquis decumbant*): which I remember to have happened to my younger brother Johannes, to say nothing of others[1]."

These early references to buying the smallpox were made *à propos* of the 17th century practice of sympathetic transference of disease from one to another, or from man to brute, or to plants, stones, holes in the ground, etc.[2], and were published as instances of "a similar superstition." The case of a transferred ague which called them forth had been sent to the *Curiosa* of the Academy by Thomas Bartholin, the celebrated anatomist of Copenhagen. Ten years before, he had written in the *Theatrum Sympatheticum Auctum*[3] (to which also Dr Sylvester Rattray, of Glasgow, and Sir Kenelm Digby contributed): "I disclose a great mystery of nature. The transplantation of diseases is a stupendous remedy, by means of which the ailments of this or that person are transferred to a brute animal, or to another person, or to some inanimate thing"—various methods being instanced. He returned to the subject in 1673 under the title of the Transplantation of Disease, the name by which Pylarini first described the engrafting of smallpox[4]. It was the transfusion of blood, a foible of the time, especially at the Royal Society in London, which set Bartholin to his second essay. He expected that health, in the one case, or disease in the other, might be transplanted to another's veins with the blood. It would be an incomparable addition to the amenities of life to be able to draw off in a syringe the diseased blood of a familiar friend and bring it to a better coction by one's own juices[5].

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[1] *Miscell. Curiosa, l. c.* 1677.

[2] See Drage, *Pyretologia.* Lond. 1665.

[3] Nuremberg, 1662, p. 529.

[4] La Condamine cites Bartholin's essay on Transplantation as if it really contained the germ of inoculation, which it does not, the single reference in it to smallpox being in a passage where the contagion of that, as well as of plague, syphilis and dysentery, is said to be capable of being turned aside from one to another.

[5] Drage (*Pyretologia*) gives a case where an ague passed from one person to another in the fumes of blood drawn in phlebotomy. He says also (*Sicknesses and Diseases from Witchcraft*, 1665, p. 21) that a witch could be made to take back a disease by scratching her and drawing blood.

Bartholin discovered the germ of these scientific developments in the scape-goat of the Israelites and in the miracle of the swine of Gadara[1]. In his own doctrine of transplantation, others in turn have found the germ of inoculation, Pylarini having actually adopted the 17th century name, with the proviso that the transplantation of smallpox was not sympathetic but *res vera mera pura*. The older idea of transplanting smallpox was to get rid of it. "Some persons in the smallpox," says Slatholm, of Buntingford, in 1657, "keep a sheep or a wether beside them in the chamber, those animals being apt to receive the envenomed matter and to draw it to themselves[2]." The developments of folk-lore are erratic; one thing leads to another, but not necessarily in a logical sequence. Transference had somehow become the inoculation which Pylarini first found in the practice of a woman from the Morea or from Bosnia, being still in its superstitious stage. The woman drew blood and rubbed the smallpox matter into the bleeding points; but whether she did so with a physiological or a symbolical intent we shall probably never know. She told Dr Le Duc[3], who submitted to inoculation at her hands, that she had received the secret from the Virgin; during the operation she muttered prayers to the Virgin, and, on finishing it, requested an oblation of two wax candles to be sent to the shrine of the Virgin her patroness in Thessaly. She pricked the skin of the face at the four points which are touched in making the sign of the Cross, and at the points of the hands and feet which are pierced by the nails in the Crucifix. Voltaire says that Lady Mary Wortley Montagu's chaplain objected to inoculation because it was an un-Christian practice. He must have been strangely ill-informed if he did so; for at Constantinople it was practised by the Christians only and not at all by the Mussulmans, who, by Kennedy's account, were somewhat doubtful of its utility.

Pylarini and Timoni very properly dropped the symbolism of the Greek woman, and inserted the matter at any convenient spot, choosing usually the skin of the forearm. Therewith they

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[1] *De Transplantatione Morborum.* Hafniae, 1673, p. 24.

[2] *De Febribus*, u. s. In the plague, a live cock applied to the botch was thought to draw the venom; the cock was then to be buried. Also crusts of hot ryeloaf hung in the room where one had died of plague absorbed the venom. Gabelhöver, *The Boock of Physicke*, Dort, 1599, p. 298. Bread was used for the same purpose in fevers as late as 1765. Muret, *Mém. par la Société Econom. de Berne*, 1766.

[3] *Dissertationes in Inoculationem Variolarum*, a J. à Castro, G. Harris, et A. le Duc. Lugd. Bat. 1722.

took the practice under scientific protection. At the same time Pylarini was careful to explain that this transference of disease, although he called it by Bartholin's old name of "transplantation," was a real thing, and in no way akin to the sympathetic or magnetic transference whose name it bore. A real thing it undoubtedly was: a visible effect did follow in most cases—some ten, or twenty or thirty watery pimples on the skin. The effect being thus real, Pylarini and Timoni laid down at the outset the doctrine that the smallpox matter inserted in minute quantity was a ferment, which produced an ebullition in the mass of the blood. The common people, who had been procuring the smallpox for their children in other ways than by puncture and insertion, also knew that the transplanting was a real thing: it was smallpox, and nothing else, that they designed to procure, peradventure it might be mild smallpox.

While Pylarini used the name of Transplantation, Timoni used the name of Inoculation. Both names were figures of speech taken from the gardener's art. Inoculation, or ineying, was a form of grafting, the taking of the "eye" or resting-bud of one kind of fruit-tree and fixing it upon the stock of another kind. The effect of a graft upon a fruit-tree is one of the most remarkable in nature: the incorporation of a bud from a nearly allied species at a particular part of the stock causes the whole tree to assume some characters of the other tree, the change being greatest in the fruit. An effect at once so real, so useful, and so familiar could not fail to take hold of the imagination. Accordingly we find the ineying or grafting of trees used in a correct figure, as in Hamlet's "for virtue cannot so inoculate our old stock but we shall relish of it." Between a fruit-tree modified as to its fruit by the permanent incorporation of a strange shoot, and an animal body infected of purpose with diseased matter, there is no very exact analogy. Figurative names, as well as metaphors, are apt to be mixed ideas. Correct science avoids the one vice, as correct style avoids the other. Transplantation had in any case too many fanciful associations to be retained as the name for the new practice in smallpox; inoculation, on the other hand, was still unspoiled as a medical term, while its wonderful effects were obvious in the familiar art of the gardener.

In all the developments or modifications of this practice, the intention was still to procure the smallpox by art. The

idea of antidote or counter-poison did not enter into it at all. Yet the idea of a counter-poison was quite familiar, as in the following passage from a medical writer of the time of James I.[1]:

> "But here a great doubt and controversie may arise: whether, as sometimes we see one poyson to be the expeller of another poyson, so in like sort, whether one stinking savour, and graveolent or ill odour, and vapour of some pestilent breath or ayre, may bee the proper amulet or preservative against any such poyson, to bee hanged about the necke: for at this time let it bee granted (to please some) that tabacco is of no good smell or sent, and that it is a little poysonous. For wee see some daily in the time of any generall or grievous infection of the plague, for avoidance thereof, and for preservation sake, will smell unto the stinking savour of some loathsome privie, or filthy camerine and sinke: and this they make reckoning is one of the best counter-poysons that may be devised against any pestiferous infection: for their nature being inured to these, they will afterwards not seeme to passe for any pestilent malignitie of the ayre, and dare boldly adventure without any prejudice, or impeachment to their health, into any place or companie whatsoever. And to perswade us the more easily to this, they object to us for example sake, those women that spend their dayes continually in hospitals for pilgrims, and for poore travellers, who are accustomed to every abominable savour of the sicke; whereof we shall never see, or very seldome, any of them either to be taken or die with any pestiferous infection though never so dangerous."

While he admits these to be instances of counter-poisons having a prophylactic effect against epidemic sickness, he denies, what some had maintained, that "either the French Pockes or the quartan ague is a *Superseder* of the plague[2]."

Results of the first Inoculations; the Controversy in England.

Thus far we have traced the rise of inoculation as an idea. It was one way of procuring the smallpox, which had gradually arisen out of other fanciful or real modes of infection. The populace for long retained a preference for giving their children the smallpox by exposing them to the contagion of it; in the last quarter of the 18th century, Haygarth found the common people of Chester still following the earlier practice of inviting the smallpox in the natural way[3]. It is even more remarkable

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[1] Gardiner's *Triall of Tabacco.* London, 1610, fol. 38.

[2] *Ibid.* fol. 43. *The City Remembrancer*, 1769, a work claiming to be Gideon Harvey's, says that in the Great Plague of London, 1665, some low persons contracted the French pox of purpose to keep off the infection of plague.

[3] *Inquiry how to prevent the Smallpox*, Chester, 1785:—"No care was taken to prevent the spreading; but on the contrary there seemed to be a general wish that all the children might have it." Cited from Mr. Edwards, surgeon, of Upton, near Chester. Again (*Sketch of a Plan, &c.*, 1793, p. 491), "They neither feared it nor shunned it. Much more frequently, by voluntary and intentional intercourse, they endeavoured to catch the infection,"

that Huxham, the ablest epidemiologist in England during the first period of inoculation, preferred that children should take the disease naturally, believing that they might be so "prepared" to receive the seeds of it by the breath as to have always a sufficiently mild but effective dose of it. Still, the insertion of smallpox matter at a puncture or wound of the arm appeared to many to have advantages over the natural way. In London it was taken up by the Court, by the Court doctors, and by the Royal Society, the leading physicians in favour of it having been Sloane, Mead, Arbuthnot and Jurin. It appears that Freind, a more learned physician than any of these, was adverse to it. It was to him that Wagstaffe, physician to St Bartholomew's Hospital, dedicated a hostile essay on inoculation when it was new; and Freind himself brought into his *History of Physic*, published in 1725–26, the following sarcastic passage upon John of Gaddesden, whom he regarded as a high-placed charlatan:

> "He had an infallible plaster and caustick for a rupture; could cure a cancer from an outward cause with red dock. And if he had lived in our day, he would, I don't question, have been at the head of the Inoculators; and in this case the position he lays down, contrary to the experience of the best physicians, that one may have the smallpox *twice*, might have served him in good stead for salvo's upon many occasions."

—which means that, in Freind's opinion, the inoculated smallpox was no security against a subsequent attack in the natural way[1].

Wagstaffe, in his printed letter to Freind, sums up the objections to inoculated smallpox as follows:

> "Some have had the distemper not at all, others to a small degree, others the worst sort, and some have died of it. I have given instances of those who have had it after inoculation in the common way; and consequently as it is hazardous, so 'twill neither answer the main design of preventing the distemper for the future. I have considered what the effects may be of inoculating on an ill habit of body, and how destructive it may prove to spread a distemper that is contagious: and how widely at length the authors in this subject disagree among themselves, and how little they have seen of the

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[1] *History of Physic*, Lond. 1725–26, II. 288. This was written at a time when the novelty of inoculation had passed off, and may be taken as Freind's mature opinion. Douglass, of Boston, writing in 1730, implies that Freind's objections had been overcome; which may mean no more than he says in general: "Yet from repeated tryals the Anti-Inoculators do now acknowledge that inoculation, generally speaking, is a more easy way of undergoing the smallpox." Condamine, in his French essay of 1755, counts Freind among the original supporters of inoculation, and ridicules the opposition to it. Munk, in citing the title of Wagstaffe's *Letter to Dr Freind showing the danger and uncertainty of Inoculating the Smallpox* (London, 1722), omits the words "to Dr Freind," at the same time describing the pamphlet as "specious." There seems no reason to doubt that Freind shared Wagstaffe's views.

practice:—all which seem to me to be just and necessary consequences of these new-fangled notions, as well as convincing reasons for the disuse of the practice[1]."

These objections were shared by several, including Blackmore, Clinch, and Massey, the apothecary to Christ's Hospital.

On the other hand Jurin, who took the lead in defending inoculation, reduced the issues to two[2]:

1. Whether the distemper given by inoculation be an effectual security to the patient against his having the smallpox afterwards in the natural way?

2. Whether the hazard of inoculation be considerably less than that of the natural smallpox?

These questions, thus put forward as of equal moment, did not receive equally full handling. Jurin dismissed the former question in a brief sentence: "Our experience, so far as it goes, has hitherto strongly favoured the affirmative side"—a conditional assent which became an absolute affirmative after a short time. Having thus disposed of the question which has all the scientific or pathological interest, he turned with his whole energy to give a precise arithmetical demonstration of what no one could doubt, namely, that inoculated smallpox was many times less fatal than smallpox in the natural way,—having got the idea of such a comparison from Nettleton as well as a large part of the statistics necessary for it. Jurin's statement of the questions at issue, and his manner of answering them, became the received mode, so much so that even towards the end of the eighteenth century one finds capable medical men contrasting the almost infinitesimal mortality from inoculation, as then practised, with the high mortality from the natural smallpox, as if that were the question at issue. The permanent impression in favour of inoculation made by Jurin's arithmetic was shown a generation later, when Dr George Baker pronounced an eulogy upon him in the Harveian Oration before the College of Physicians in 1761[3]. "It was his special glory," said the orator, to have "confirmed the practice of inoculation by his ex-

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[1] Hecquet, of Paris, who is supposed to have been the original of Dr Sangrado in 'Gil Blas,' gave the following reasons against inoculation (*Raisons de doutes contre l'Inoculation*): "Its antiquity is not sufficiently ascertained: the operation rests upon false facts: it is unjust, void of art, destitute of rules:......it doth not prevent the natural smallpox:......it bears no likeness to physic, and savours strongly of magic."

[2] James Jurin, M.D., *Account of the Success of Inoculation*, 1724, p. 3.

[3] G. Baker, M.D., *Oratio Harveiana*, 1761, p. 24.

periments and his authority." There was only one experiment, and it was a remarkable one. The Princess of Wales had begged George I. to pardon six Newgate criminals under sentence of death on condition that they would submit to be inoculated. It was assumed that those six had not had smallpox in infancy or childhood, and Sloane, relating the facts in a letter to Ranby some years after, does in fact call them "six condemned criminals who had not had the smallpox[1]." The concurrence of six persons belonging to the criminal classes and about to be hanged together in Newgate, of whom none had already gone through the common infantile trouble of London and other large towns, was singular. They were inoculated, and it was found that they had escaped the death penalty on very easy terms: John Alcock, aged twenty, had most smallpox, but even he had "not more than sixty pustules"; Richard Evans, aged nineteen, had none, but his antecedents were inquired into, and then it was found that he had had smallpox in gaol only six months before. One of the others, a woman named Elizabeth, was chosen for the grand crucial experiment. Sir Hans Sloane and Dr Steigerthal clubbed together to pay her expenses to Hertford where smallpox was then very prevalent; thither Elizabeth went and ministered among the sick; she lay in bed with one in the smallpox, or she lay in bed with various in the smallpox; at all events she exposed herself to contagion and did not catch it, according to certificates from the woman she lodged with and from another person, which certificates were published with much formality and lawyer-like precision[2]. This was the single experiment in which Jurin had any part. What were the chances of her having had smallpox in childhood? What were the chances of her knowing anything about it, or telling the truth about it if she knew? (One of her fellows in the experiment upon the pardoned convicts had smallpox only six months before, but the fact was not discovered until it was wanted.) What were the chances of her taking smallpox at Hertford, supposing that she had hitherto escaped it? These questions do not appear to have been debated[3].

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[1] Sloane, *Phil. Trans.* XLIX. 516.

[2] They are given in Maitland's *Vindication*, 1722, and in one of Jurin's papers.

[3] In regard to the last of them, when Frewen in 1759 was controverting the fancy of Boerhaave and Cheyne that smallpox might be hindered from coming on in a person exposed to contagion by a timely use of the Aethiops mineral, he said there was a fallacy in the evidence, because many persons ordinarily escape smallpox "who had been supposed to be in the greatest danger of taking it." Huxham also pointed out

Such was the experiment by which Jurin "confirmed the practice of inoculation." As for his authority, it was doubtless considerable; but it was more as a follower of the Newtonian mathematics than as a pathologist or physician, and most of all as one of the secretaries of the Royal Society in the last years of Newton's presidency, that he spoke with authority[1]. His influence, such as it was, availed little. The practice of inoculation fell into total disuse in England after a few years' trial, so that in 1728 Jurin himself was prepared to see it "exploded."

The principal reason of inoculation having been tried upon decreasing numbers in England after the first year or two, and of its having been dropped absolutely for a time, was the death of some persons of good family, both adults and children—a sacrifice of life which could not but seem gratuitous. Those deaths were not from the fulness of the eruption but from anomalous effects. When inoculation began in London in 1721, it was according to the Greek method of inserting a minute quantity of matter at two or more places. In the case of the Newgate felons, Maitland had reason to do the inoculations over

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that a person might be susceptible at one time but not at another, or insusceptible altogether; and the elder Heberden wrote: "Many instances have occurred to me which show that one who had never had the smallpox may safely associate, and even be in the same bed with a variolous patient for the first two or three days of the eruption without any danger of receiving the infection." William Heberden, sen., M.D., *Commentaries on Disease*, 1802, p. 437.

[1] Dr James Jurin was educated at Cambridge, and elected a fellow of Trinity College. He became a schoolmaster at Newcastle, where he also gave scientific lectures. Coming to London, with a Leyden medical degree, he devoted himself to the Newtonian mathematics and was made one of the secretaries of the Royal Society, Newton being the president. He was one of the original physicians of the new hospital founded in the Borough by Guy, the rich bookseller. He made a fortune by medical practice, and was elected president of the College of Physicians a few weeks before he died. In medicine his name is associated with the inoculation statistics, the idea of which, as well as most of the substance, he got from Nettleton, and with "Jurin's Lixivium Lithontripticum," or solvent for the stone, the idea of which belonged originally to Mrs Johanna Stevens, and was sold by her to the State for five thousand pounds on the 16th of June, 1739, the prescriptions having been made public in the *London Gazette* of 19th June. On the 15th of December, 1744, Jurin was called to see the Earl of Orford (Sir Robert Walpole), who was suffering from stone, either renal or vesical. He began administering his alkaline solvent, "four times stronger than the strongest capital soap-lye," and during the six weeks of his attendance had given his patient thirty-six ounces of it. Horace Walpole made him angry by arguing on the medicine: "It is of so great violence that it is to split a stone when it arrives at it, and yet it is to do no damage to all the tender intestines through which it must first pass. I told him I thought it was like an admiral going on a secret expedition of war with instructions which are not to be opened till he arrives in such a latitude." (*Letters of Horace Walpole*, Cunningham, I. 339.) His services were at length dispensed with, and the earl, whose case was probably hopeless before, died in a few weeks. A war of pamphlets followed, Ranby, the serjeant-surgeon, maintaining that the patient had "died of the lixivium." Mead, also, expressed himself strongly upon the attempt to use a modification of Mrs Stevens's solvent.

again after three days, being dissatisfied with the appearance of the original punctures. They are admitted to have had a slight disease (the man who had most had only some sixty pustules on his whole body), so that Dr Wagstaffe, who went to see them, said in his letter to Dr Freind: "Upon the whole, Sir, in the cases mentioned, there was nothing like the smallpox, either in symptoms, appearances, advance of the pustules, or the course of the distemper." Many of the other early cases had likewise a slight eruption; when numbers are given, the pocks are "not more than eleven to eighteen" (as in Maitland's case of Prince Frederick at Hanover in 1724), or "not above twenty in all upon her" (as in Maitland's case of a child near Hertford, in 1721). Of the first six charity children inoculated, one had no eruption; of the next five, three had no smallpox from inoculation. The cases that died after inoculation during the first seven years of the practice —seventeen in England and Scotland and two in Dublin, most of them children—owed the fatal result for the most part to some peculiar prostration or lowered vitality, in two cases actually to pyaemia, the eruption being kept back altogether or but feebly thrown out[1]. This was the danger of arbitrarily procuring the smallpox which Dr Schultz remarked upon in 1677, with reference to the Polish practice of "buying" the disease; most, if not all the cases known to him, although they may have had few pocks, yet fell into more serious illness (*gravius reliquis decumbant*). The risk of arbitrarily forcing infection upon a child at a time when it might not be ready for it, or in a position to deal with it in its blood, was afterwards recognized, and was provided against in the long and tedious preparation which the subject for inoculation had to undergo.

While those in England who followed Maitland in inoculating after the Greek fashion produced for the most part an infinitesimal number of pustules or watery pimples, there were others at a distance from London who inoculated by a method of their own and gave their patients a more real smallpox. The chief of these were Dr Thomas Nettleton of Halifax, and Dr Zabdiel Boylston, of Boston, New England[2]. Nettleton made a long incision through the whole thickness of the skin of

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[1] The fatalities are given somewhat fully in Jurin's annual accounts of the *Success of Inoculation*, 1723—27.

[2] John Wreden, body-surgeon to the Prince of Wales, author of *An Essay on the Inoculation of the Smallpox* (Lond. 1779), may also be counted among those who gave a more real smallpox. See especially his cases at Hanover.

one arm and of the opposite leg, and laid therein a small piece of cotton soaked in smallpox matter, which he secured in the wound with a plaister for twenty-four hours. Boylston says: "The Turkey way of scarifying and applying the nutshell &c., I soon left off, and made an incision through the true skin," the rest also of his procedure being the same as Nettleton's. And just as those two inoculators devised for themselves a more real method of giving the smallpox by insertion, taking means to ensure the absorption of the matter into the blood, so they procured in many cases, although not in all, an eruption of pustules on the skin which came near to being the same as that of natural smallpox of the average discrete type.

In the Boston practice, "the number of the pustules is not alike in all; in some they are very few; in others they amount to an hundred; yea in many they amount unto several hundreds, frequently unto more than what the accounts from the Levant say is usual there[1]." Nettleton's account, which was printed in the same number of the *Philosophical Transactions* as that from New England, says of the pustules on the skin at large: "The number was very different: in some not above ten or twenty, most frequently from fifty to two hundred; and some have had more than could well be numbered, but never of the confluent sort....They commonly come out very round and florid, and many times rose as large as any I have observed of the natural sort, going off with a yellow crust or scab as usual[2]."

The smallpox procured by inoculation in these English and American trials was thus a more real form of that disease than at Constantinople; compared with the number of pustules given by Timoni and Pylarini, the Boston and Halifax numbers are multiplied ten times.

Nettleton thus expressed his belief that inoculated smallpox saved from the natural disease, at the same time grounding that belief on the reality or substantial nature of the artificial disease:

> "Some of those who have been inoculated, that are grown up, have afterwards attended others in the smallpox, and it has often happen'd that in families where some children have been inoculated, others have been afterwards seized in the natural way, and they have lain together in the same bed all the time; but we have not yet found that ever any had the distemper

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[1] H. Newman, "Way of Proceeding in the Smallpox Inoculation in New England." *Phil. Trans.* XXXII. (1722), p. 33.

[2] Thomas Nettleton, Letter to Whitaker. *Ibid.* p. 39.

twice; neither is there any reason to suppose it possible, there being no difference that can be observed betwixt the natural and artificial sort, but only that in the latter the pustules are fewer in number, and all the rest of the symptoms are in the same proportion more favourable[1]."

Nettleton returned to the question of the reality of inoculated smallpox, which is the root of the whole matter, in his second letter, to Jurin[2]: "The question whether the distemper raised by inoculation is really the smallpox is not so much disputed now as it was at first....There is usually no manner of difference to be observed betwixt the one sort and the other, when the number of pustules is nearly the same; but in both there are almost infinite degrees of the distemper according to the difference of that number. All the variation that can be perceived of the ingrafted smallpox from the natural is, that in the former the pustules are commonly fewer in number, and all the rest of the symptoms are in the same proportion more favourable. They exactly resemble what we call the distinct sort....It will follow as a corollary, that those who have been inoculated are in no more danger of receiving the distemper again than those who have had it in the ordinary way. And this is also thus far confirmed by experience."

It does not appear that Nettleton based so much upon the subsequent experience as upon the antecedent probability. Thus he says of some cases:

"These had the eruptions so imperfect as to leave me a little in doubt, but two of these have since been sufficiently try'd by being constantly with those who had the smallpox, without receiving any infection; which makes me inclined to believe they will always be secure from any danger. As to all the rest, neither I nor anybody else who saw them did in the least question that they had the true smallpox."

Nettleton began his inoculations in and around Halifax during a considerable epidemic of smallpox in the winter of 1721–22, of which the following figures were collected by himself (as well as statistics for Leeds, Bradford, Rochdale and other places):

	Cases	Deaths
Halifax	276	43
Part of Halifax parish towards Bradford	297	59
Another part of Halifax parish	268	28

In the town of Halifax the smallpox was of a more favourable type than usual, whereas in Leeds at the same time (792 cases and 189 deaths) it was more than usually mortal. In the country round Halifax there was more smallpox than in the town; but the epidemic in general ceased in the spring of 1722. As the people mostly disliked the idea of inoculation, Nettleton did not urge it upon them, but inoculated only the children of those who favoured it. Down to the 22nd of April, 1722, he had inoculated about forty, with one death; at the date of 16

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[1] *Phil. Trans. l. c.* p. 46. A remark follows which is not quite clear: "There is one observation which I have made, tho' I would not yet lay any great stress upon it, that in families where any have been inoculated, those who have been afterwards seized never had an ill sort of smallpox, but always recovered very well."

[2] *Phil. Trans.* 1722, p. 209. Dated from Halifax, 16 Dec. 1722.

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June, he had done fifteen more, his total to the end of 1722 being 61. In 1723 he did nineteen inoculations, in 1724 none, in 1725 and 1726 about forty (in an epidemic of 230 cases, and 28 deaths in Barstand Ripponden and another part of Halifax parish), and in writing to Hartley of Bury St Edmunds in 1730, he gave his total at that date as 119, from which it appears that he had ceased to inoculate after 1726. His name does not appear again in the controversy, and it is probable that he acquiesced in the tacit verdict against inoculation which Jurin himself, in 1728, seemed to think was imminent.

Besides this centre of inoculation in Yorkshire in the midst of epidemic smallpox, the only other of importance in the first trials of the practice was at Boston, New England. The smallpox epidemic there in 1721 was a very severe one. There had been no smallpox in Boston since 1702, so that a large part of the population were susceptible of it. The infection was brought by a ship from Barbados in the middle of April, 1721, and made slow progress at first, according to the following table of deaths from it[1]:

Deaths from Smallpox in Boston.

1721–1722

May	1	October	402
June	8	November	249
July	20	December	31
August	26	January	6
September	101	Total	844

In the course of the epidemic some 5989 persons were attacked, or more than half the population (10,565). All the rest, save about 750, had been through the smallpox before. Inoculation played a very subordinate part amidst these dreadful scenes of smallpox. Its instigator was the Rev. Dr Cotton Mather, who had been shown by Dr Douglass the numbers of the *Philosophical Transactions* with Timoni's and Pylarini's papers in them. The reverend doctor "surreptitiously" employed Douglass's rival, Dr Boylston, to begin inoculating, in July, 1721, or a few months after the first trials in London. Boylston

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[1] Dr William Douglass to Dr Cadwallader Colden, 28 July, 1721, and 1 May, 1722, in *Massachu. Hist. Soc. Collections*, Series 4, vol. II. pp. 166–9. Also *A Dissertation concerning Inoculation of Smallpox*. By W. D[ouglass]. Boston, 1730; and *A Practical Essay concerning the Smallpox*. By William Douglass, M.D. Boston, 1730.

inoculated 244, whites and negroes, and admitted the deaths of six of them, probably by inhaled infection[1]. But Douglass says:

> "The precise number of those who dyed by inoculation in Boston, I am afraid will never be known because of the crowd of the sick and dead whilst inoculation prevailed most, the inoculator and relations inviolably keeping the secret....Some porters who at that time were employed to carry the dead to their graves say that it was whispered, in sundry houses where the dead were carried from, that the person had been inoculated. I could name some who are suspected, but having only hearsay and conjectural evidence, I forbear to affront the surviving relations. I myself am certain of one more who died 'after inoculation' as they express it."

He then gives the case, which was clearly one of the natural contagion of smallpox acquired at the same time as the inoculation. In the Charleston inoculations of 1738, which were also done in the midst of an epidemic, there is little doubt that the fatalities were mostly from natural smallpox which the inoculated infection had failed to anticipate or prevent. The inoculators were often in that dilemma with their fatal cases: either the inoculation had killed the patient or it had been powerless to keep off the contagion; sometimes they confess the former as an untoward accident, at other times they plead the latter, which appears to me to have been the more usual of the two in a time of epidemic smallpox[2].

Douglass, for all his bitterness against his rival Boylston, and his severity against the extravagant assertions and loose reasoning of the first inoculators, was far from denying the merits of inoculation, whether in theory or in practice. "We may confidently pronounce," he says, "that those who have had a genuine smallpox by inoculation never can have the smallpox again in a natural way, both by reason and experience; but there are some who have had the usual feverish symptoms, a discharge by their incisions, with a few *imperfect* eruptions,

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[1] Boylston, *Account of the Smallpox inoculated in New England.* London, 1726.

[2] This was admitted, in a manner, for the great Boston epidemic of 1752, by the Rev. T. Prince, *Gent. Magaz.* Sept. 1753, p. 414. The epidemic attacked 5545 (in a population of 15,684), and cut off 569. The numbers inoculated were 2124 (including 139 negroes), of which number 30 died and were included in the total of 569. Many of the inoculated, says Prince, were not careful to avoid catching the infection in the natural way; "for I have known some, as soon as inoculated, receive visits from their friends, who had been with the sick of the same disease and 'tis likely carried infection with them; it seems highly probable that the inoculated received the infection from them into their vitals." It may be supposed that the inoculated who were more careful formed a part of the 1843 who "moved out of town." More than a third of the population took natural smallpox in some four months (April to July) of 1752, more than a third had had it before, a severe epidemic having occurred in 1730 as well as in 1721.

that may be obnoxious to the smallpox,"—of which he gives instances. In like manner Nettleton, in Yorkshire, who took pains to make his smallpox a real thing, and succeeded in doing so as well as any inoculator ever did succeed, was persuaded that inoculated smallpox counted for a natural attack. He admitted only one failure, a case at Halifax which had been inoculated without an eruption ensuing and took smallpox by contagion a month after. Failures in England, in that sense, were fewer than the deaths directly from inoculation. The deaths were freely admitted, but any alleged failure of inoculation to ward off the natural smallpox was challenged, investigated, and denied, so that Mead, writing in 1747, declared that he knew of none. There were, however, a few cases recorded, which appear to be authentic. One of the six charity children inoculated at the instance of the Princess of Wales had taken natural smallpox twelve weeks after. The child of one Degrave, a surgeon, had a similar experience. Another familiar case was the son of a person of distinction, inoculated on 7 May, 1724, by the Rev. Mr Johnson.

> On the 14th a rash came out, on the 15th there was fever, on the 16th, very little eruption to be seen and the fever gone, and on the 18th he was pronounced "secure." On that day (18th May), his sister was inoculated in the same place. both children remaining together at the inoculator's house until the 2nd of June, when the boy went home. For a day or two before the 8th of June the boy was ill, and on the 9th he began to have smallpox in the natural way, of a good sort, the disease keeping its natural course. He was supposed to have caught it from his sister, who was inoculated after his own protection was over, and was "very full of smallpox" until the 27th of May, her brother being with her[1].

Another case of failure, which must have been known to some at the time, was not published until some ten years after, when Deering brought it to light[2]:

> "I was an eyewitness of the inoculation of a little boy. the child of Dr Craft, who is now a sugar-baker in the Savoy. He was inoculated by one Ahlers under the direction of Dr Steigerthal, the late king's physician in ordinary; and notwithstanding the great care there was taken in the choice of the pus, had the confluent kind severely; and twelve months after had them naturally, and though a favourable sort, yet was very full."

A boy aged three, the son of Mr Richards, M.P. for Bridport, was inoculated in 1743, and had fifty to sixty pocks which maturated and scabbed. About two years after ("one year ago") he had smallpox again, the pustules numbering from 200

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[1] Clinch, *Rise and Progress of the Smallpox, with an Appendix to prove that Inoculation is no Security from the Natural Smallpox.* 2nd ed. 1725.

[2] C. Deering, M.D., *An Account of an Improved Method of treating the Smallpox.* Nottingham, 1736, p. 27. Woodville appears to accept this case as authentic.

to 300; when the eruption came out the fever declined and did not return. These facts are given in a letter to Dr Dod from Dr Brodrepp, grandfather of the child, who attended him on both occasions[1].

Such cases were not often heard of. As Mead said, "If such a thing happened once, why do we not see it come to pass oftener?" There was, however, little encouragement for anyone to come forward with adverse evidence; witness the case of an unfortunate Welshman, one Jones, of Oswestry, who had innocently mentioned, in writing to his son in London, that natural smallpox had followed an inoculation done by him, on 9th August, 1723, and was frightened out of his wits by the *apparatus criticus* which Jurin brought to bear upon him[2]. Another reason why so few failures could be discovered was that the inoculated were not kept long in sight. A child of Dr Timoni, the first writer on inoculation, was inoculated at Constantinople in December, 1717, at the age of six months, and had an average effect, namely ten small *boutons*. She died of smallpox in 1741, at the age of twenty-four. This failure came to light by the vigilance of the celebrated De Haën, of Vienna, an opponent of inoculation, who had been told of it by a Scots physician at Constantinople[3].

A good instance of the same thing came to light long after in the practice of the celebrated Dr Rush of Philadelphia. "I lately attended a man in the smallpox," he wrote to Lettsom, "whom I inoculated six-and-twenty years ago. He showed me a deep and extensive scar upon his arm made by the variolous matter"—without which evidence, and the man's own reminder, confirmed by his mother's recollection, Dr Rush would probably have had no reason to believe that this particular one of his inoculations had failed[4].

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[1] Pierce Dod, M.D., F.R.S., *Several Cases in Physic.* London, 1746.

[2] Kirkpatrick, and after him Woodville, treat the alleged experience of Jones as pure fiction.

[3] La Condamine, of Paris, an amateur enthusiast for inoculation, did all he could to upset the case. He got his friend Dr Maty, foreign secretary of the Royal Society, to make inquiry through the British ambassador to the Porte. It happened that Angelo Timoni, son of the inoculator, was at that time an interpreter at the British Embassy; he applied to his mother, who re-affirmed the facts as to the inoculation of her child in infancy, and her death by the natural smallpox twenty-four years after. The only defence left was that the inoculation had not been done by Dr Timoni's own hand. La Condamine, *Mémoires pour servir à l'Histoire de l'Inoculation.* 2me Mémoire. Paris, 1768.

[4] Rush to Lettsom, Philadelphia, 17 June, 1808, in Pettigrew's *Memoirs of Lettsom*, III. 201.

In the nature of the case, such evidence of failure would seldom be opportune. It would have needed a more dramatic presentation of these cases, and many more of them, to discredit the practice of inoculation. It was, indeed, discredited, so much so that it was not practised at all in England from 1728 until about 1740; but that was owing to the disasters directly resulting from it. No amount of evidence as to the inoculated taking natural smallpox afterwards could have touched the popular imagination like the following paragraphs in the London newspapers in 1725:

> March 16, died Mrs Eyles, niece of Sir John Eyles, alderman of London, of the smallpox contracted by inoculation. June 17, died of the smallpox contracted by inoculation Arthur Hill, esquire, eldest son of Viscount Hilsborough. August 12, died of the smallpox by inoculation — Hurst, of Salisbury, esquire.

Inoculation seemed hardly worth having on these terms, granting all that was alleged of its protective power; so that it fell in England into total disuse[1]. It came on again after a time and had a long career, at first among the richer classes, and at length among the common people, who did not cease to use it for their children until it was made a felony by the Act of 1840. After its first brief success, it was revived about 1739–40, in consequence of highly favourable accounts from Charleston, South Carolina, and from Barbados and St Christopher. This second period of inoculation brings in certain modifications of the practice by which the casualties of the earlier period were avoided. The danger from blood-poisoning, pyaemia, or the like, was surmounted. At the same time the inoculated smallpox ceased to have anything of that reality, or approximation to the natural disease, which Nettleton succeeded for a time in giving to it.

Revival of Inoculation in 1740: a New Method.

As early as the Boston inoculations of 1721, the matter had now and again been taken, not from a case of the natural

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[1] Fuller, in his *Exanthematalogia*, makes a somewhat late defence of it in 1729. But Richard Holland, who published in 1730 *A Short View of the Smallpox*, does not mention inoculation, and in the following passage he writes of smallpox as if the extravagant hopes of the preceding years had vanished: "This last season having afforded too many melancholy instances of the fatal effects of the distemper, though under the care and direction of the most eminent physicians, since the disease, notwithstanding the plainness of its symptoms, is become the *opprobrium medicinae*," &c. (p. 3).

smallpox, but from the pustules of a previous inoculation[1]. But at Charleston in 1738 there really began, doubtless in the way of empirical trial, a systematic attenuation of virus, which has had great scientific developments in our time and has come to be considered as of the essence of the inoculation principle. Describing the South Carolina practice, Kilpatrick says[2]:

> "Some persons were of opinion that *the pock of the inoculated* would be too mild to convey the disease; or, at least, that it must become effete by a second or third transplantation. Experience manifested the contrary. I have inoculated from those who were infected by the matter taken from others of the inoculated, and found no defect. Mr Mowbray, who inoculated many more than any other practitioner, assured me he had infused matter in the fifth or sixth succession from the natural pock, and observed no difference....The smallest violation of the surface, if it was stained with blood, was a sufficient entrance for the matter, and the least matter was sufficient."

The last point was a return to the Greek practice, and an abandonment of the more severe method of Nettleton and Boylston.

The Charleston smallpox of 1738, imported by slave-ships from Africa, became extensively epidemic and mortal. It had been last in Charleston fourteen or fifteen years before, but only one or two died on that occasion, and hardly more than ten were attacked. But for that small outbreak, it had not been known in the South Carolina port for a generation previous to 1738. The number of victims in that year is not known precisely. As at Boston in 1721, the epidemic dragged through the spring months, and became very extensive and mortal in the hot weather of June and July. It was then that Mowbray began inoculating, most of the Charleston faculty being opposed to it. He was soon followed by Kilpatrick, who had lost one of his children in the epidemic, and was moved thereby to inoculate the other two. No exact account was kept of the inoculations, nor, we may be sure, of the protective effects; some said a thousand were inoculated, Kilpatrick says eight hundred, but the total of four hundred is also given. Eight died after

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[1] *Phil. Trans.* Jan.-March, 1722: "The way of proceeding in the Small Pox inoculated in New England." Communicated by Henry Newman, Esq. of the Middle Temple, p. 33, § 3: "Yet we find the variolous matter fetched from those that have the inoculated smallpox altogether as agreeable and effectual as any other."

[2] *An Essay on Inoculation: occasioned by the Smallpox being brought into S. Carolina in the year* 1738. By J. Kilpatrick. London, 1743, p. 50. The essay had been "first printed in South Carolina," the London edition of 1743 having an Appendix dealing historically with the Charleston epidemic of 1738.

inoculation, six whites and two negresses. One child of ten months died in convulsions on the ninth day after inoculation, with few signs of smallpox; a minister, aged 40, sickened on the third or fourth day, which was too soon for the artificial disease, and was almost certainly the effects of the inhaled virus; two other adult whites died in such circumstances as to make it doubtful whether they died of inoculation or of coexistent natural smallpox; one negress died of confluent smallpox, having treated herself unwisely; while two other children and a negress died after inoculation, of whom no particulars are known. Besides the fatal cases after inoculation, some "had an eruption that might be called a moderate confluence"; but in these cases also it is not clear that infection was not taken in the natural way: as regards one gentlewoman who had confluent smallpox, it was not certain in what manner she received the infection, whilst "Miss Mary Rhett's eruption did not appear until the 14th day, yet was supposed to be effected by art." To meet such cases Kilpatrick adopted the doctrine that there was "no precise term for the artificial eruption." Among those "hardly dealt with" by the disease, supposed to have been given by art, were two ladies who had their eyes permanently injured. "With regard to a second infection of the inoculated *who took*, this was asserted by some who wished for it, but were as soon refuted." Nineteen in twenty of the inoculated had an exceedingly slight eruption, so slight indeed that they thought the confinement indoors irksome and unnecessary. As to the negroes, who had all been born in Africa (and commonly have smallpox there or in the voyage across), it was not easy, he admits, to find out whether they had had smallpox before or not, the pits on their faces being less obvious than in whites, and the marks of other distempers easily mistaken for them. On the whole Kilpatrick was confident that inoculation in this epidemic had saved many lives; and it was the rumour of its success, together with corresponding reports from the plantations in the West Indies relating the valuable lives of negroes saved, that gave a fresh impulse to the practice in England. In 1743 Kilpatrick came to London, where he republished his Charleston essay, with an historical appendix, and soon got into the leading practice as an inoculator, having proceeded to the degree of M.D. and changed the spelling of his name to Kirkpatrick. Woodville says "he was esteemed the most scientific inoculator

in London." During the eleven years from his setting up in practice there until the publication of his *Analysis of Inoculation* (1754), he had almost certainly been applying the arm-to-arm method which he learned from Mowbray in Charleston, having briefly indicated it in his first essay and avowed it more explicitly in his second. The establishment of Kirkpatrick in London, to practise the Charleston method of inoculation, corresponds, as nearly as one can trace it, with the revival of the practice in the south of England, to the extent of some two thousand cases in the counties of Kent, Surrey, Sussex, Hampshire and Dorset. We have a glimpse of that practice in the essay on inoculation published in 1749 by Dr Frewen, of Rye in Sussex[1], a physician of considerable learning (of the school of Boerhaave), whose theories of the effects of inoculation are reflected in Kirkpatrick's *Analysis* of 1754. In 350 cases, Frewen had only one fatality, the death of a child, aged four, from worm fever on the eighth day of a discrete eruption. He still used the incision on the arm, but less deep than Nettleton's, keeping the pledget of lint, moistened with matter, bound upon it for twenty-four hours; also he encouraged the rendering from the incision for some weeks, giving the same reason as before, that "Nature by means of a continual drain is greatly aided in her attempts to throw off the matter of the disease." In his general account of the effects of inoculation, we seem to be reading of as real symptoms and as many pocks as Nettleton described—the eruption, always of the simple distinct kind, beginning on the 9th day, all out in three or four days after, the pocks filling and turning yellow for the next four or five days, then scabbing and falling, leaving temporary shallow marks. But it is clear that he had other results than these from trying new ways of procuring matter. "Experience," he says, "has convinced me that it is in reality of no consequence from what kind of smallpox it [the matter] is procured." If taken from the natural smallpox, it should be taken from ripe pustules: "yet I have sometimes applied it sooner, while only a limpid water." Oftentimes it happened that an inoculation produced too "slight" pustules to furnish matter for the succeeding operations. The question then arose whether the matter rendering from the incisions on the arms in these cases was

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[1] Thomas Frewen, M.D., *The Practice and Theory of Inoculation.* London, 1749.

merely common pus or whether it had the property of "variolosity." This abstract quality, as it were the essence or quiddity of the pustular exanthem, was assumed to be present if the pus of the rendering incision could be made to raise a pustule on another arm, and if the person so infected could stand exposure to natural smallpox with impunity. One person so inoculated did have an attack of smallpox by contagion, so that Frewen concluded that the matter used for his protection had "run off all its variolosity." But others inoculated with the same, "in whom the symptoms were remarkably light, and in some few no pustules at all," were equally exposed to contagion without catching it, so that they were "judged to be secure from ever taking the smallpox again." Frewen's general conclusion, if it be not very logical, is at least modest:

> "However, it may be worth the attention to reflect seriously whether it be not highly probable, from the success attending the numbers I have been concerned for, that inoculation has been often times a security against taking the most dangerous kinds of the natural smallpox."

Whether Frewen got the ideas of these novelties of method from Kirkpatrick's first account of the South Carolina practice, or struck them out for himself, it is clear that Kirkpatrick, in his next essay of 1754, has adopted variolosity as an abstract doctrine to surmount certain difficulties in the concrete reason. Many of his inoculated cases had only a few bastard pustules of smallpox, some had none. Was their disease smallpox? Did it warrant their future security?

> "As many of the inoculated have very few pustules, and they are sometimes disposed to scab and wither away with very little suppuration, it might be of service to discover that the matter from the incisions would infect. But it would be certainly satisfactory to find it would where there was no eruption from inoculation, as its variolosity would greatly warrant the future security of the person it was taken from. That it is variolous is now evinced by the fact that it infected others to the like slight degree[1]."

The movement towards attenuating the virus used for inoculation was general in Europe. One of the mild methods, invented by Tronchin, of Amsterdam and afterwards of Paris, was to raise a small blister on the arm and to pass through the fluid a thread moistened with smallpox matter. This became one of the most common continental methods and was in use until the beginning of the 19th century. Kirkpatrick, who went

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[1] J. Kirkpatrick, M.D., *Analysis of Inoculation, with a consideration of the most remarkable appearances in the Small Pocks.* Lond. 1754.

to see the practice of Tronchin, found the method by blister to produce as slight effects in the way of eruption as he describes for his own method :

> "I attended and infected five poor children:—three, about seven years old, by incision; and two, about five years old, by vesication. Of the first three, one, a girl, had a pretty moderate but very kindly sprinkling; the two boys very few. The two by blisters, a boy and a girl, had rather less,—the boy Dudin, a very fair delicate little child, not having above three or four, all which had not matter enough to infect one patient[1]."

Everywhere after the middle of the eighteenth century inoculation was coming into fashion again. In France it was lauded by the *philosophes*, while it was scouted by the medical faculty. La Condamine, a mathematician who had acquired fame by his journey to the Amazon to measure the three first degrees of the meridian, became interested in the subject by hearing from a credulous Carmelite missionary at Para how he had saved half of his Indian converts by inoculation after the other half had been destroyed by the natural smallpox. The mathematical philosopher on his return became an enthusiast for inoculation, and twice harangued the Académie des Sciences thereon. "The practice of inoculation," he said, "was improved during the time of its disgrace." What this improvement consisted in he also explained: "Neither the eruption is essential to the natural nor the pustules to the artificial smallpox: and perhaps art will one day come to effect what one hopes for and what Boerhaave and Lobb have even tried—I mean a change in the external form of this malady without any increase of its danger[2]."

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[1] Kirkpatrick, *Analysis.*

[2] La Condamine, *Mémoires pour servir, &c.* (Deuxième Discours), 1768, p. 91. It matters little what Lobb may or may not have done. But it does not appear that Boerhaave ever tried to get rid of the eruption of smallpox by means of drugs. In the chapter of his *Aphorisms*, "De Variolis" (§ 1392) he says that he imagines a specific might be found, in the class of antidotes, to correct and destroy the variolous virus, indicating antimony and mercury as likely agents for the purpose owing to certain physical properties of the medicinal preparations of them. Ruston (*An Essay on Inoculation*, 3rd ed. 1768) says that Boerhaave, who died in 1738, "never practised it himself; nor seems to have understood the manner in which these medicines operate to produce their salutary effects." However they were known as the Boerhaavian antidotes to smallpox, and were used in Rhode Island, it is said with great success and as a secret. Ruston used them in England, and discovered by an analysis that Sutton's secret powders were the same. They seem also to have been used by Cheyne to prevent the development of smallpox in persons who had been exposed to contagion and had presumably taken the contagion. Frewen, in 1759, published a pamphlet to show the improbability of antimony and mercury having any such action, and the fallacy of the claims made for their success.

The Suttonian Inoculation.

Daniel Sutton, though an empiric, has given his name to the slight and safe method of inoculation which had been used in England for a good many years before his advent. So completely was his name joined to the practice of smallpox inoculation in its later period that in a Bill before Parliament in 1808 it is called "the Suttonian inoculation," to distinguish it from cowpox inoculation. The idea of attenuating the virus used for inoculation, and of making the effects minimal, was not his. It had been reached empirically years before by Mowbray, of Charleston, in 1738, who carried inoculation from arm to arm to the fifth remove, by Frewen, of Rye, in 1749, who was satisfied with an abstract "variolosity" of the incisions, in cases where there was no eruption at all or only a few pustules that did not fill, by Kirkpatrick, "the most scientific inoculator in London," who endorsed the doctrine of variolosity, by La Condamine, and most of all by Gatti of Paris.

Gatti used the unripe matter from a previous inoculation and inserted a most minute quantity of it at a very small puncture; and, to make sure that no general eruption should follow, he used the cooling regimen in various ways, including the prolonged immersion of the hands in cold water. Thus he promised his clients "the benefits of inoculation without its risks." But Gatti's career of prosperity was cut short by a series of conspicuous failures of his artificial smallpox to prevent the natural or real disease when it was epidemic. One of his patients, the Duchess de Boufflers, a great lady whose *salon* was frequented by the *philosophes* and *beaux esprits*, fell into the natural smallpox two years and a half after her inoculation[1].

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[1] The Duchess gave the following account of her own case (*Gent. Magaz.* Nov. 1765, p. 495, sent by Gatti to a friend in London): "On the 12th of March, 1763, I was inoculated for the smallpox, and about four or five days afterwards a redness appeared round the orifice, which Mons. Gatti called an inflammation, and assured me was a sign that the smallpox had taken effect: these were the very terms he used. The redness or inflammation increased every day, and about the seventh or eighth day, the wound began to suppurate. There appeared also about the wound six small risings, or pimples, which successively suppurated and disappeared the next day. Mons. Gatti, upon their appearance, again assured me that the smallpox had taken effect. In the afternoon of the eleventh or twelfth day of my inoculation I felt a general uneasiness and emotion, a pain in my head and my back, and about my heart, in consequence of which I went to bed sooner than ordinary. I slept well, however, and rose without any disorder in the morning. These symptoms Mons. Gatti assured me were the forerunners of the eruption. The next day a pretty large rising

So many others in Paris had the same disappointment that a discussion arose in the Faculty of Medicine, the result of which was that the Parliament of Paris prohibited the practice of inoculation, for various reasons, within the limits of the capital.

Gatti's friend and correspondent in London was Dr Maty, who, "though born in Holland might be considered a Frenchman, but he was fixed in London by the practice of physic and an office in the British Museum[1]." Having conducted the foreign correspondence of the Royal Society, he became in 1765 its secretary in ordinary, and about the same time Principal Librarian of the British Museum. His interest in inoculation, which was shown by his translating La Condamine's first discourse on that subject in 1755, led him in 1765 to suggest to Gatti that he should write an essay for publication in England, "both to reclaim the thinking part of Paris, and to vindicate his own operations from the contemptuous treatment of his antagonists." The essay was written in due course, and Maty brought it out in English[2].

Gatti's own experiments and those which had previously been made in England by the most experienced inoculators had satisfied him of the truth of what he had long suspected, namely, that the operation could be made "still more harmless, though not less efficacious" (p. 29). There would be hardly any fever, certainly a very slight eruption and perhaps none at all (p. 68), It had, indeed, been questioned whether a patient who had but very few pustules, or only one, has had the smallpox as truly as

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or pimple appeared in my forehead, turned white, and then died away, leaving a mark which continued many days.

"The wound in my arm continued to suppurate seven or eight days, and Mons. Gatti now assured me that I had nothing to fear from the smallpox; and upon this assurance I relied without the least doubt, and continued in perfect confidence of my security till the natural smallpox appeared. I continued very well during the whole time of my inoculation, except one day, as mentioned above, and I went out every day. "Monmorency, D. de Boufflers."

[1] Gibbon's *Autobiography*. It was to Dr Maty that Gibbon, in 1759, submitted his French essay on the Study of Literature, having had a fair copy of it transcribed by one of the French prisoners at Petersfield. Of Maty he says: "His reputation was justly founded on the eighteen volumes of the *Journal Britannique*, which he had supported almost alone, with perseverance and success. This humble though useful labour, which had once been dignified by the genius of Bayle and the learning of Le Clerc, was not disgraced by the taste, the knowledge and the judgment of Maty."

[2] Angelo Gatti, M.D., *New Observations on Inoculation*. Translated from the French by M. Maty. Lond. 1768. The French edition was published at Brussels in 1767.

one who has been very full, and whether he is equally safe from catching it. He answers in the affirmative, according to the doctrine of variolosity: "No reason can be alleged, why we should have the smallpox but once, that will not equally hold good for one as for ten thousand pustules" (p. 69). Some, however, will not believe that one pustule is as good as ten thousand, "notwithstanding the obviousness of this truth." If one were absolutely bent upon giving a certain number of pustules, he would advise to inoculate according to his method (insertion with a needle) at twenty, thirty, or fifty places: "then you would be sure of one pustule at least at each puncture, and, probably, of many more in other parts." He would do this, however, only to humour prejudice, and with a feeling that he was doing the patient "more harm than was necessary." He was seriously satisfied of the "sufficiency of a single pustule," and believed that every wise man should run the venture of it and "embrace the method here laid down."

There was no theoretical objection to this method, but there was the practical one, that it might be *too* slight in its effects. Patients could hardly rest satisfied with so little to show for smallpox; and inoculators themselves found that they might have all their work to do over again. An eminent Irish physician wrote in 1765 to Dr Andrew, of Exeter, that crude matter from a previous inoculation was "less communicative of the disorder and more apt to disappoint us" than matter from a natural smallpox eruption taken "five or six days before the maturation of it[1]." It was also the experience of Salmade, of Paris, in 1798, that serous matter, taken from arm to arm through a long succession of cases, was apt to go off altogether, or to be "weakened to the point of nullity," whereby it disappointed the operator[2]. Reid, of Chelsea Hospital, was said to have carried the succession to thirty removes from the natural smallpox. Bromfeild knew for certain of matter being used at the sixteenth remove.

So long as the operation held at all, and had not to be repeated, Dr Andrew believed that effects which "no one would have taken for the smallpox," were "sufficient security against

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[1] John Andrew, M.D., *The Practice of Inoculation impartially considered.* Dated 17 June, 1765, Exeter, p. 61.

[2] *La Pratique de l'Inoculation.* Paris, An. VII. (1798), p 51.

any future infection[1]." Heberden, indeed, has recorded a case adverse to that view; but one case is not enough, even if it had been in as eminent a person as Madame de Boufflers[2].

Daniel Sutton, who gave his name to the slighter kind of smallpox inoculation, was not a regular practitioner. His father, a doctor of medicine in Suffolk, was a specialist inoculator, as others of the regular profession here and there were becoming, and had operated upon 2514 patients from 1757 to 1767. In 1763 Daniel began business on his own account at Ingatestone in Essex, where patients from all parts were boarded and subjected to his regimen, as at a water-cure. In 1764 he made 2000 guineas, and in 1765 £6300. In the three years 1764–66 he inoculated 13,792 persons, and his assistants some 6000 more—without a single death. Sutton kept his method at first a secret, and for that reason was looked at askance by eminent physicians. He used pills and powders, which were found, by the analysis of Ruston, to be a preparation of antimony and mercury, the drugs supposed to be antidotes to natural smallpox, or the means of preventing its pustular eruption. But the essence of his method was found to be, in Chandler's words, "the taking of the infective humour in a crude state [from a previous inoculation] before it has been, if I may allow the expression, variolated by the succeeding fever[3]," or, in Dimsdale's words, "inoculating with *recent* fluid matter," or in Sir George Baker's words, "with the moisture taken from the arm before the eruption of the smallpox, nay, within four days after the operation has been performed[4]."

Sutton made it known that the effects of this method were exceedingly mild—no keeping of bed, no trouble at all: "if any

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[1] Andrew, u. s. p. 53.

[2] "I am sorry to have found that this operation has not always secured the patient from having the smallpox afterwards, if the eruptions have been imperfect without maturation. I attended one in a very full smallpox, which ran through all its stages in the usual manner; yet this patient had been inoculated ten years before, and, on the 5th day after inoculation, began to be feverish, with a headache, followed by a slight eruption, which eruption soon went off without coming to suppuration; the place of inoculation had inflamed and remained open ten days, leaving a deep scar, which I saw." William Heberden, Senr., M.D., *Commentaries on Disease* (p. 436). This was published in 1802, after the author's death; but as he was in the height of his practice from 1760 onwards, the case, which is undated, may be taken as illustrating Heberden's position in the Suttonian controversy.

[3] Benj. Chandler, M.D., *An Essay on the Present Method of Inoculation.* Lond. 1767.

[4] *Method of Inoculating the Smallpox.* Lond. 1766. Baker thought he was "an enemy of improvement and no philosopher," who stood upon the antecedent improbability of securing the patient by a minimal inoculation such as Sutton used.

patient has twenty or thirty pustules, he is said to have the smallpox very heavy." Being put on his trial at Chelmsford for spreading abroad the contagious particles of smallpox by the number of his inoculations, his defence was to have been (if the bill had not been thrown out by the grand jury), that he "never brought into Chelmsford a patient who was capable of infecting a bystander." The mildness of his artificial smallpox was acknowledged with satisfaction by some, with dissatisfaction by others. Dr Giles Watts, an inoculator in Kent, says it was "a most extraordinary improvement. The art of inoculation is enabled to reduce the distemper to almost as low a degree as we could wish... There is now an opportunity of seeing what a very small number of the multitude of persons of all ages, habits and constitutions, who have been inoculated in these parts, have been ill after it." Comparing it with the method which he had practised before, he says that he never knew ten or twelve inoculated together "in the old way" but one or more had the distemper in a pretty severe manner; on the other hand, he had inoculated four of his children in the new way and all of them together had not so many as eighty pustules. He adds that sometimes the inoculated had not even a single pustule (besides the one at the point of insertion) or at other times not more than two or three[1].

The Suttonian practice was objected to by Bromfeild in an essay dedicated to Queen Charlotte. Tracing it to Gatti, whose manifesto had been published in England two years before, he said that it was mere credulity "to have given credit to a man who should assert, that he would give them a disease which should not produce one single symptom that could characterize it from their usual state of health... Inoculation, though hitherto a great blessing to our island, will in a very short time be brought into disgrace," if it were assumed "that health and security from the disease can be equally obtained by reducing the patients so low as only to produce five to fifteen pimples[2]."

Bromfeild was not openly supported except by Dr Langton, of Salisbury, who contended that "the matter communicated is not the smallpox, because numbers have been inoculated a

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[1] Giles Watts, M.D., *Vindication of the Method of Inoculating.* London, 1767.

[2] William Bromfeild, *Thoughts on the Method of treating Persons Inoculated for the Smallpox.* Lond. 1767. He was a Court surgeon and a man of some eminence. Morgagni dedicated one of the books of his *De Sedibus et Causis Morborum* to him as representing the Royal Society.

second, third and fourth time, that therefore it is no security against a future infection." He cites Gatti's case of the Duchess de Boufflers, and declares, as to the English inoculations, that not above one in ten have so many variolous symptoms as may be remarked in her case. "The old method of inoculating," he says, "was to take the infection from a good subject where the pustules were well maturated, whereby the operation was sure of succeeding; but the present practice is to take the matter from the incision the fourth day after the incision is made [this was Sutton's avowed practice]. By this means you have a contagious caustic water instead of laudable pus, and a slight ferment in the lymph is raised, producing a few watery blotches in the place of a perfect extrusion of the variolous matter[1]."

There was no difference of opinion as to the exact purport and upshot of the new method; it was to reduce the eruption to the lowest point or to a vanishing point. Nothing can be more emphatic than Gatti's profession of belief that a single pustule, at the place of insertion, was as effectual as ten thousand; and it is not only likely, on the face of it, that such a mitigation as Reid's to the thirtieth remove from natural smallpox, would produce merely the local pustule, but it is clear that Gatti saw no way of ensuring more by his method, supposing he were to gratify the prejudices of the laity in favour of more, than by puncturing the skin at twenty, thirty, or fifty separate points. It is not to be supposed, however, that the minimum result was obtained in all cases, or that all inoculators were equally adroit in procuring it; even Sutton had to admit that some of his thirteen thousand patients had more pustules on the skin than he desired.

Perhaps the most exact record of the number of pustules produced in a comparative trial of various methods is that of Sir William Watson at the Foundling Hospital in 1768[2]. Of 74 children inoculated in October and November, twelve had no eruption at all, but yet were held to have been protected by the operation. The remaining sixty-two had a very small average

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[1] W. Langton, M.D., *Address to the Public on the present Method of Inoculation.* London and Salisbury, 1767. Dr Thomas Glass, of Exeter, replied in 1767 to Bromfeild and Langton, in *A Letter to Dr Baker on the Means of procuring a Distinct and Favourable Kind of Smallpox.* Lond. 1767, and in a *Second Letter to Dr Baker,* 1767.

[2] W. Watson, M.D., *An Account of a Series of Experiments instituted with a view of ascertaining the most successful Method of Inoculating the Smallpox.* London, 1768.

of pustules in addition to the local pustules, which average, small as it was, came mostly from two or three severer cases (e.g. one with 440 pustules, one with 260, and one with near 200), the most having three or four or a dozen or perhaps two dozen (e.g. three had only 7 pustules among them, or, in another batch of ten done with crude or ichorous matter, "the most that any boy had was 25, the least 4, the most that any girl had was 6, the least 3," or, in another batch of ten, also with crude lymph, two had no eruption, seven had 35 pustules among them, and one had 30). Of the amount of smallpox upon the whole sixty-two cases which had some eruption Watson says: "Physicians daily see in one limb only of an adult person labouring under the coherent, not to say confluent smallpox, a greater quantity of variolous matter than was found in all these persons put together."

Watson's sole measure of "success" in inoculating was the slightness of the effect produced; and as he found that crude or watery matter from the punctured spot of a previous inoculation had the least effect, he decided to use that kind of matter always in future at the Foundling Hospital. On the other hand, Mudge, of Plymouth, raised a different issue and put it to the test of experiment on a large scale. Did crude matter infect the constitution? Did it make the patient insusceptible of the effects of a second inoculation with purulent matter? The experiment came out thus:

At Plympton, in Devonshire, in the year 1776, thirty persons were inoculated with crude or watery matter from the arm of a woman who had been inoculated five days before, and ten persons were at the same time inoculated with purulent matter from the pustules of a case of natural smallpox. The thirty done with crude matter had each "a large prominent pustule" at the place of puncture, "but not one of them had any eruptive fever or subsequent eruption on any part of the body." Matter taken from their local pustules produced exactly the same result in the next remove, namely, a local pustule, but no eruptive fever nor eruptive pustules. The thirty were inoculated again, this time with purulent matter (five from natural smallpox, twenty-five from inoculated smallpox), and all of them had, besides the local pustule, an eruptive fever and an eruption "in the usual way of inoculated patients." The ten who were originally inoculated with purulent matter had that result at first[1].

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[1] John Mudge, Surgeon at Plymouth, *A Dissertation on the Inoculated Smallpox.*

In the subsequent history of inoculation it would appear that the method known by the name of Sutton, of using crude or watery matter from a previous inoculated case, was the one commonly preferred. But it was not always preferred. One of the medical neighbours of the afterwards celebrated Dr Jenner took matter from the pustules and kept it in a phial; his patients inoculated therewith had somewhat active effects, even "sometimes eruptions." But "many of them unfortunately fell victims to the contagion of smallpox, as if they had never been under the influence of this artificial disease," so that Jenner, who had probably not heard of Mudge's experiment, was confirmed in his preference for the crude matter (before the eruptive fever) from a previous inoculation. It was of great importance, he said, to attend to that point, as it would "prevent much subsequent mischief and confusion[1]." Of course there were many more chances of getting matter from natural smallpox than from inoculated; but it would appear that in the former also it was taken in the ichorous or unripe stage of the eruption, according to the practice of Sutton, and despite the experimental proof that Mudge gave of its merely superficial or formal effects.

Mudge's experiment was on a large scale, and designed to test a general or scientific issue. The testing experiment usually made was merely for the sake of the particular case; the patient was inoculated a second time, shortly after the first, with the same matter as before, or a third time, or even a fourth time. Whatever the significance of this for the doctrine of inoculation in general (as in the issue raised by Mudge), the individual was both reassured and fortified so far as concerned his own safety. The experiment of the former generation that was usually cited was that of the Hon. John Yorke. On his leaving the university at the age of one and twenty it was thought prudent that he should be inoculated for smallpox before entering on the great world. He was inoculated by serjeant surgeon Hawkins, and had the local suppuration, some fever, but little or no eruption. The inoculator was satisfied, but not so the youth:

London, 1777. A copy of this essay was found in the library of Dr Samuel Johnson. The Doctor was a friend of the author's father, the Rev. Archdeacon Mudge, whose published sermons he has characterized in one of his most amusing balanced sentences of praise qualified with blame. Johnson stood godfather to one of John Mudge's children. Notes on "Dr Johnson's Library," by A. W. Hutton.

[1] Edward Jenner, M.D., *Inquiry into the Causes and Effects of the Variolae Vaccinae, or Cowpox.* Lond. 1798, p. 56. See also his *Further Observations on the Cowpox.* 1799.

he insisted upon a second inoculation, which had no effect. This was considered a leading case. When the Suttonian method came in, and the absence of eruption (barring a few pimples or bastard pustules) became the usual thing, the occasions for a second inoculation became more common, owing to the prejudice, as Gatti said, of the laity in favour of something tangible although not excessive[1].

Dimsdale inoculated many of his patients a second time, and produced the local pustule again, as at first. Of the 74 foundlings in Watson's experiment of Oct.–Nov. 1767, there were twelve who had no eruption, of whom four were re-inoculated with no better result or with no result. Of the whole twelve he says: "Although they had no eruption, I consider them as having in all probability gone through the disease, as the punctures of almost all of them were inflamed and turgid many days." It was so unusual for a second inoculation, in a doubtful case, to produce more than the first, that Kite, of Gravesend, communicated to the Medical Society of London two cases where that had happened, as being "anomalous." He had never before been able to communicate the smallpox, on a second attempt, "to any patient whose arm had inflamed, and who had even a much less degree of fever" than Case 1, who had only the local pustule and "on the eighth day was quite well:" and he cites Dimsdale to the same effect[2].

Perhaps enough has been said to illustrate the subtle casuistry that had gradually arisen out of the old problem of procuring the smallpox by artifice. I make one more citation, from a Hampshire inoculator in 1786, to show how fine were the distinctions, depending, one might suppose, upon the subjective state of the practitioner, drawn between effective and non-effective inoculation:

> "The incisions sometimes have a partial inflammation for a few days, which then vanishes without producing any illness; in this case the patient

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[1] Langton cites the following advertisement put out on 18 June, 1767, in his own district by Messrs Slatter and Duke, surgeons, of Ringwood, Hants: "The first objection I shall take notice of is that the disorder being in general so light, it is imagined there is danger of a second infection [i.e. a natural attack]. Whenever this has been supposed to have happened, I am certain the operation has failed, which not being discovered by the operator, proves to me that he was not experienced in the practice; for it may always be determined in four, five, or six days, sometimes sooner; and if there is the least reason to doubt, it is very easy to inoculate a second, third or fourth time, which may be done without the least inconvenience. I have inoculated several patients three or four times for their own satisfaction, having very little or perhaps no eruption."

[2] *Mem. Med. Soc. Lond.* IV. 114.

is certainly still liable to infection; but I believe it very rarely happens that there is any matter, or even ichor, in the present slight manner they are made, without producing the smallpox....I have constantly remarked that when the punctured part inflames properly, and is attended with an efflorescence, rather inclining to a crimson colour, for some distance round the same, about the eleventh or twelfth day from the inoculation, although the patient should have very little illness and no eruption, yet that he is secure from all future infection[1]."

Extent of Inoculation in Britain to the end of the 18th Century.

From 1721 to 1727 the inoculations in all England were known with considerable accuracy to have been 857; in 1728 they declined to 37; and for the next ten or twelve years they were of no account. The southern counties led the revival in the fifth decade of the century, so that before long some two thousand had been inoculated in Surrey, Kent, Sussex and Hampshire. Frewen, however, who could point to 350 cases done by himself in Sussex previous to 1749, says that it "gained but little credit among the common sort of people, who began to dispute about the lawfulness of propagating diseases, and whether or no the smallpox produced by inoculation would be a certain security against taking it by infection," etc.

In London, after the revival under Kirkpatrick's influence in 1743, inoculation became a lucrative branch of surgical practice, and was done by the heads of the profession—Ranby, Hawkins, Middleton and others, and almost exclusively among the well-to-do. In 1747 Ranby had inoculated 827 without losing one; in 1754 his total, still without a death, had reached 1200. In 1754 Middleton had done 800 inoculations, with one death. The operation was by no means so simple as it looked. It required the combined wits of a physician, a surgeon, and an apothecary; while the preparation of the patient to receive the matter was an affair of weeks and of much physicking and regimen. Thus inoculation was for a long time the privilege of those who could pay for it. As late as 1781, when a movement was started for giving the poor of Liverpool the benefits of inoculation, it was stated in the programme of the charity that, "as the matter now stands, inoculation in Liverpool is confined almost exclusively to the higher ranks," the wealthier

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[1] John Covey, of Basingstoke, 8 May, 1786, in *London Medical Journal*, VII. p. 180.

inhabitants having generally availed themselves of it for many years[1].

The first project in London for gratuitous inoculation took shape, along with the plan of a smallpox hospital, at a meeting held in February, 1746, in the vestry-room of St Paul's, Covent Garden[2]. The original house of the charity, called the Middlesex County Hospital for Smallpox, was opened in July, 1746, in Windmill Street, Tottenham Court Road, but was shortly removed to Mortimer Street, and again, to Lower Street, Islington. The charity opened also a smallpox hospital in Bethnal Green, which eventually contained forty-four beds. The Inoculation Hospital proper, used for the tedious preparation of subjects, was a house in Old Street, St Luke's, with accommodation for fifteen persons. Besides the smallpox hospital at Islington, the charity had, in 1750, a neighbouring house in Frog Lane, for the reception of patients after they had been inoculated in the Old Street house. Down to the middle of 1750 there had been admitted 620 patients in the natural smallpox, while only 34 had gone through the process of inoculation. The latter involved a month's preparation, and about a fortnight's detention after the operation was done; so that a new batch of subjects was inoculated but once in seven weeks. In 1752 the governors of the charity purchased a large building in Coldbath Fields, which they fitted with one hundred and thirty beds, as a hospital both for cases of the natural smallpox and for preparing subjects to undergo inoculation (the Old Street house being still retained for the latter purpose). The next important change was in 1768, when a large new hospital was opened at St Pancras, to be solely a house of preparation, the old hospital in Coldbath Fields being now turned to the double purpose of receiving the patients from St Pancras after their inoculation and of receiving patients in the natural smallpox. Thus the inoculation business of the charity, which had begun with being subordinate to the treatment of those sick of the natural smallpox, gradually encroached upon the latter and became paramount. The inoculations, which had been only 112 in the year 1752, reached the total of

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[1] *Address to the Inhabitants of Liverpool on the subject of a General Inoculation for the Smallpox.* 1 September, 1781.

[2] The account of the London charity is taken from the *History of Inoculation in Great Britain* (1796) by Woodville, who became physician to it in 1791.

1084 in the year 1768, while the admissions for smallpox "in the natural way" from 24 March, 1767, to 24 March, 1768, were 700.

In the year 1762–63, the admissions for natural smallpox had been 844, and for inoculations 439. One reason of the great increase of patients received for inoculation after that date was the rise of the Suttonian practice, which had vogue enough to attract numbers, and at the same time was so much simplified in the matter of preparation and in its results that many more could go through the hospitals in a given time. The inoculations by the Smallpox Charity were done in batches, men and boys at one time, women and girls at another, on some eight or twelve occasions in the year, of which public notice was given.

The following table is taken from the annual report of the Smallpox and Inoculation Hospitals for the year 1868.

Period	Inoculations	Period	Inoculations
Previous to Oct. 1749	17	1758 1759	446
Oct. 1749-Oct. 1750	29	1760	372
Oct. 1750-Oct. 1751	85	1761	429
1752	112	1762	496
1753	129	1763	439
1754	135	1764	383
1755	217	1765	394
1756	281	1766	633
1757	247	1767	653
		1768	1084

These charitable efforts to keep down smallpox in London hardly touched the mass of the people, and did not touch at all the infants and young children among whom nearly all the cases occurred. The charity admitted no subjects for inoculation under the age of seven years. It aimed at giving to a certain number of the working class, or of the domestics or other dependents of the rich, the same individual protection that their betters paid for. Meanwhile there were on an average about twelve thousand cases of smallpox in London from year to year, mostly in infants and young children. The first proposal to apply inoculation to these came in 1767, from Dr Maty, in a paper on "The Advantages of Early Inoculation." This physician, distinguished in letters and now become a librarian, sought to recommend inoculation for infants by glorifying the purity of their juices and the natural vigour of their constitutions, which was something of a paradox at a time when half the

infants born in London were dying before the end of their third year. He saw as in a vision how smallpox would be extinguished by making inoculation universal:

> "When once all the adults susceptible of the infection should either have received it or be dead without suffering from it, the very want of the variolous matter would put a stop to both the natural and artificial smallpox. Inoculation then would cease to be necessary, and therefore be laid aside[1]."

Eight years after, in 1775, Dr Lettsom seriously took up the project of inoculating infants in London[2]. He started a Society for Inoculation at the Homes of the People, which effected nothing besides some inoculations done by Lettsom himself during an epidemic "in confined streets and courts." In 1779 he launched another scheme for a "General Inoculation Dispensary for the benefit of the poor throughout London, Westminster and Southwark, without removing them from their own habitations[3]." That also was frustrated by the active opposition of Dimsdale[4]. The objection to it was that there was no prospect of making the practice universal, and that partial inoculations in the crowded quarters of London would merely serve to keep the contagion of smallpox more active than ever. Lettsom answered that the danger of contagion from inoculated smallpox was more theoretical than real, inasmuch as the amount of smallpox matter produced upon the inoculated was a mere trifle[5].

At Newcastle, Lettsom's design had at least a trial, under the influence of his friend Dr John Clark[6]. The Dispensary, founded in 1777, was designed from the outset to undertake gratuitous inoculations; but it was not until 13 April, 1786, that it got to work. The "liberality of the public" enabled the managers in that year to offer premiums to parents, to cover the expense of having their children sick from inoculation—five shillings for one child, seven shillings for two, nine shillings for

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[1] *Med. Obs. and Inquiries*, III. (1767), p. 287. The passage quoted (p. 306, *note*) is almost exactly in the words of Hufeland long after, with reference to the probable extinction of smallpox by cowpox. See his *Journal*, X. pt. 2, p. 189.

[2] J. C. Lettsom, *A Letter to Sir Robert Barker, F.R.S. and G. Stacpoole, Esq. upon General Inoculation*. London, 1778.

[3] *A Plan of the General Inoculating Dispensary, &c.* Lond. (no date).

[4] T. Dimsdale, *Thoughts on General and Partial Inoculation*. Lond. 1776. *An Introduction to the Plan of the Inoculation Dispensary*. 1778. *Remarks on Dr Lettsom's letter to Barker and Stacpoole*. 1779.

[5] Lettsom, *Obs. on Baron Dimsdale's Remarks, &c.* 1779; and other pamphlets on both sides.

[6] Clark, *Report of the Newcastle Dispensary*. 1789.

three, and ten shillings for four or more of a family. On the first occasion, 208 children were inoculated, and all recovered. From 1786 to 1801, the cases numbered 3268. It was the aim of Dr Clark to get the operation done in infancy; accordingly in the space of four and a half years (1786–1790), of 1056 inoculations 460 were on infants under one year, 270 from one to two, 122 from two to three, 69 from three to four, 62 from four to five, 66 from five to ten, and 7 from ten to fifteen. This was perhaps the most systematic attempt at infant inoculation from year to year. The other dispensaries at which inoculation was steadily offered to the children of the poor were at Whitehaven (1079 inoculations from 1783 to 1796), at Bath, and at Chester.

Before the society was started at Chester for the purpose, the inoculations were some fifteen or twenty in a year, and these, we may suppose, in the richer families. The society got to work in 1779, but its operations were stopped in 1780 by a singular cause—the general diffusion of smallpox in the town by a regiment of soldiers. The whole inoculations of poor children from the spring of 1780 until September, 1782, were 213, besides which 203 were done in private practice. The year 1781 was tolerably free from epidemic smallpox (8 deaths), but in January, 1782, a very mortal kind prevailed in several parts of the town.

At Liverpool the first gratuitous general inoculation was in the autumn of 1781, to the number of about 517. "The affluent," says Currie, "being alarmed at the advertisement for this purpose, presented their children also in great numbers, and 161 passed through the disease." There was a second gratuitous inoculation in the spring of 1782 (to which some of the above numbers may have belonged), and it was intended to continue the same at regular intervals; but there is no record of more than those two[1].

Although Dimsdale opposed "general" inoculations in the large towns, for the reasons mentioned, he was in favour of inoculating together all the susceptible subjects in a smaller place or country district; and that kind of general inoculation was not unfrequently undertaken, sometimes hurriedly at the beginning of an epidemic, at other times after an epidemic had

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[1] Currie to Haygarth, 28 Nov. 1791, in *Sketch of a Plan, etc.*, pp. 451, 207.

been running its course for months, and here or there, it would seem, during a free interval and by way of general precaution.

Dimsdale himself, with the help of Ingenhousz, carried out on one occasion, in Berkhamstead and three or four other villages of Hertfordshire, a general inoculation to the number, he guesses, of some six hundred persons of all ages, including some quite old persons. In 1765 or 1766 Daniel Sutton at Maldon, Essex, inoculated in one morning 417 of all ages, who were said to be all those in the town that had not had smallpox in the natural way. Some hundreds were also inoculated by him at one time in Maidstone.

In the small Gloucestershire town of Painswick in 1786, a very violent and fatal smallpox broke out during a time of typhus and intermittent fever. In consequence of the epidemic, one surgeon inoculated 738 persons from the 26th of May to the end of June[1]. In another Gloucestershire parish, Dursley, a single surgeon in the spring of 1797 inoculated 1475 persons of all ages, "from a fortnight to seventy years." But in certain villages near Leeds in 1786–7 a general inoculation, organised by a zealous clergyman and paid for by a nobleman, mustered only eighty. About the same time, during an epidemic of malignant smallpox at Luton, Bedfordshire, 1215 were inoculated, and thereafter about 700 more; the average number annually attacked by smallpox during a period of nine years had been about twenty-five[2].

Inoculation was tried first in Scotland in 1726 by Maitland, during a visit to his native Aberdeenshire, but was not persevered with owing to one or two fatalities among the half-dozen cases. About 1733 it was begun at Dumfries by Gilchrist, who practised it during the next thirty years upon 560 persons, most of them, doubtless, paying patients. The returns made to Professor Monro, of Edinburgh, showed in the chief medical practices 5554 inoculations down to 1765; of which 703 were in Edinburgh and Leith, 950 in Glasgow, 208 in Stirling, 260 in Irvine, 157 in Aberdeen, 310 in Banff, 243 in Thurso, and 560 in Dumfries as above[3]. Seventy-two deaths are put down to the

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[1] J. C. Jenner, "An Account of a General Inoculation at Painswick." *Lond. Med. Journ.* VII. 163–8.

[2] *Gent. Magaz.* April, 1788, reported by the Hon. and Rev. Mr Stuart, who was a grandson of Lady Mary Wortley Montagu.

[3] Monro, *Account of Inoculation in Scotland*, 1765; in his *Works*. Edin. 1781, p. 693.

practice. When the Statistical Account of the 938 parishes was compiled in the last decade of the century, a few of the parish ministers made reference to inoculation.

Thus, in Applecross, Ross-shire, and three neighbouring parishes, an uneducated man is said to have inoculated 700 after a very fatal epidemic in 1789; it happened, however, that the pestilence reappeared, whereupon inoculation was "generally adopted[1]." Applecross may have been populous then; now there is not a smoke to be seen in it for miles. Again, the practice is said to have become "universal" in Skye from about 1780[2]. In Durness parish, which the tourist may now traverse for thirteen miles to Cape Wrath without seeing anyone but a shepherd, inoculation was rendered "general" about 1780 by the benevolence of a gentleman belonging to the parish[3]. From October, 1796, to July, 1797, a surgeon of Thurso inoculated 645 in that town and in country parishes of Caithness during a very severe epidemic[4]. In the parish of Jedburgh the cost of an inoculation was defrayed by the heritors, in that of Kirkwall by the kirk session, in another by the commissioners of annexed estates, in Earlstown, Berwickshire (on 70 children) by the chief proprietor. The ministers who mention it at all were mostly strong advocates of it, but they usually imply that the common people were (or had been) apathetic or prejudiced. It was sometimes recommended from the pulpit, and actually done by the ministers; it was even recommended that students of divinity should be instructed in the art. Statements that it had become "general" or "universal" are made for several parishes, mostly in the Highlands or Islands. The very full and trustworthy account of the parish of Banff says that "inoculation is by no means become general among the lower ranks[5];" which is perhaps about the truth for the country at large.

At the end of an epidemic at Leeds, in 1781, which had attacked 462 and killed 130 during six months, "in the next six months there were inoculated 385, of whom four died" (two by contagious smallpox). A second general inoculation was carried out in Leeds sometime previous to 1788. Lucas, writing in that year, says: "The result of two general inoculations in Leeds has been that the smallpox has since been less frequent and less fatal[6]." This will be a convenient opportunity of considering the gross effects of inoculation upon the prevalence of smallpox.

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[1] *Statistical Account of Scotland.* 1791–99, III. 376.

[2] *Ibid.* IV. 130. It was about the year 1782 that the College of Physicians of Edinburgh appointed a committee to inquire into the mode of conducting the gratis inoculations of the poor, which had been tried at Chester, Leeds, Liverpool, &c. in 1781–82. Haygarth, u.s. 1784, p. 207.

[3] *Ibid.* III. 582.

[4] *Ibid.* XX. 502–7.

[5] *Ibid.* XX. 348. Account by Rev. Abercromby Gordon, who gives in a note (p. 349) the following instance of professional zeal: "A surgeon in the north, presuming that self-interest has a stronger hold on man than superstition, has lately opened a policy of insurance for the smallpox! If a subscriber gives him two guineas for inoculating his child, the surgeon in the event of the child's death pays ten guineas to the parent; for every guinea subscribed, four guineas, for half a guinea, two guineas, and for a crown one guinea."

[6] James Lucas, *Lond. Med. Journ.* X. 269.

The first and most obvious consideration is that it usually came too late. "Most born in London," said Lettsom quite correctly, "have smallpox before they are seven"—i.e. before the age for admission to the inoculation hospital. He might have added that, if they had run the gauntlet of smallpox in London until they were seven, they were little likely to take it at all. The inoculations in London were therefore done upon a very select class (they were, in fact, a very small number), who may be assumed to have escaped the perils of smallpox in London in their childhood, or to have come to London (as many did) from country places where smallpox broke out as an epidemic only at long intervals. In other large towns as well as the capital the inoculated must have been a residual class. At Leeds, with a population of 17,117, "the number of those who were still uninfected was found on a survey to be 700" at the end of an epidemic, of whom 385 were inoculated. If a general inoculation had been tried at Chester after the epidemic of 1774, there would have been only 1060, in a population of 14,713, to try it on. How many of these, above the age of childhood, were constitutionally proof against smallpox? The case of Ware, in Hertfordshire, after the epidemic in the summer of 1777, is so related by Lettsom as to bring out the ambiguity of much that was claimed for inoculation. "After about eighty had been carried off by it, a general inoculation was proposed, to prevent those who had not yet been attacked, and whose number was still considerable, from sharing the same fate. The alarm which had been excited induced most of the survivors to adopt this proposition, after which not one died, and the infection was wholly eradicated." Eighty deaths in one epidemic is a large mortality for such a place as Ware in any circumstances; the smallpox for once had done its worst. But, says Lettsom, there were a few families of those hitherto untouched by the epidemic who did not submit to inoculation. Not one of them caught the disease—from their inoculated neighbours (Lettsom is arguing that there was no danger in that way), nor, of course, from the epidemic contagion. It cannot but appear strange to us that the natural cessation or exhaustion of an epidemic should not have been thought of. Dr Currie, of Liverpool, records that in the first general inoculation there in 1781 there were 417 inoculated gratuitously and about 100 more in private practice, and that "about three or four thousand liable to the disease were

scattered in the same manner [as the inoculated], not one of whom caught the infection." For a few weeks there was not a case of smallpox known in Liverpool, so that no matter could be got for inoculation. He adds, in the most ingenuous manner: "An important particular has been recalled to my mind by Mr Park; that previous to this first general inoculation, which extinguished the smallpox in so extraordinary a way, the disease raged in town with much violence and was very fatal[1]."

The general inoculations were often carried out in so haphazard a manner as to make them valueless for a scientific as well as for a practical purpose. A Bath surgeon of long experience wrote in 1800: "Whenever the inoculating rage once takes place whole parishes are doomed, without the least attention to age, sex, or temperament—no previous preparation, no after treatment or concern...Are not scores and hundreds seized upon at once, for the incisions, scratchings, puncturings and threadings, without even a possibility of their being properly attended to? and whether they may or may not receive the infection is just as little known or cared about[2]." It must have been equally little known or cared about whether they had had smallpox in the natural way before. What Dimsdale found to obtain at St Petersburg would have been the rule elsewhere: "The general method was to search for marks, and, if none were found, it was concluded the party had not had the disease[3]."

Thus in any attempt to estimate the gross advantages of inoculation in the 18th century we are met on every hand by sources of fallacy. Whatever its theoretical correctness, it does not follow that the inoculation of smallpox was a practical success to the extent of its trial; and even its theoretical correctness will be thought by some, and was so thought at the time, to have gone by the board when the artificial disease was brought down to a pustule at the point of puncture, with or without a few bastard pocks on the skin near. I have found two instances in the 18th century history in which there are data for a rough practical judgment, although not for a precise

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[1] Currie to Haygarth, 28 Nov. 1791, in the latter's *Sketch of a Plan, &c.* p. 453.

[2] *A Conscious View of Circumstances and Proceedings respecting Vaccine Inoculation.* Bath, 1800. The author was probably James Nooth, senior surgeon to the Bath Hospital, who removed to London and practised in Queen Anne Street, holding the appointment of surgeon to the Duke of Kent. He wrote on cancer of the breast.

[3] *Tracts on Inoculation.* London, 1781.

statistical one. The first is the town of Blandford, in Dorset; the other is the Foundling Hospital in London.

During the smallpox year 1766, smallpox of a very malignant type broke out at Blandford in the first week of April[1]. It was estimated that 700 persons in the town (population 2110 in 1773) had not had the natural smallpox, and a general inoculation was resolved upon on the 13th April. "A perfect rage for inoculation," says Dr Pulteney[2], "seized the whole town." and in the week following the 16th April some 300 were inoculated, the total rising to 384 before the panic ceased; of these, 150 were paid for by the parish. There were thirteen deaths among the inoculated, but most of these confluent or haemorrhagic cases, seem to have been due to the epidemic contagious smallpox, which had been peculiarly fatal, with haemorrhagic symptoms, to the few that were seized before the inoculation began, and continued to be fatal to many. The mortality from smallpox for the year in the parish register was 44, and from all causes 104, or more than twice the normal[2]. The last epidemic of smallpox in Blandford had been in 1753, when 40 died of it, the deaths from all causes being 96. In that year also there had been a general inoculation to the number of 309. The parish register gives the deaths in an earlier epidemic, in 1741, which was a year of great distress and typhus fever all over England: 76 deaths are ascribed to smallpox (102 to all causes), which is a larger total from smallpox than in either of the subsequent occasions when general inoculations were tried. Comparing these three epidemics in a Table, with the associated circumstances, we get the following:

Statistics of Blandford in three Smallpox Years (Population in 1773, 2110).

Year of Epidemic	Deaths from all causes	Deaths from Smallpox	Inoculations	Annual Averages of eight previous years		
				Marriages	Births	Deaths
1741	102	74% 76	—	24·87	63·37	49·25
1753	96	40 41	309	19·37	50·62	49·62
1766	104	44 42	384	20·62	54·12	49·12

It will be seen that the higher mortality from smallpox in 1741 was associated with other things besides the absence of inoculation. The annual average of deaths for eight years preceding each of the three epidemics is almost the same. But the marriages and births for eight years preceding 1741 were much in excess of those in the periods preceding the other two epidemic years. In the former there was a much larger susceptible population of children, upon which the smallpox mainly fell; and that alone would account for more deaths from smallpox in the epidemic of 1741. But the year 1741 was peculiar in another way; it was the worst year of typhus fever and general distress in the whole of the 18th century, and in the circumstances the deaths from smallpox would have been unusually numerous for the cases. Another epidemic of smallpox without inoculation, in 1731, showed how mild smallpox could be. At a time when sixty families had the disease

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[1] R. Pulteney, M.D., in a letter of 21 June, 1766, to Dr G. Baker, given in his *Inquiry into the Merits of a Method of Inoculating the Smallpox.* Lond. 1766.

[2] Pulteney, "Births, Deaths and Marriages of Blandford Forum, 1733–1772." *Phil. Trans.* LXVIII. 615.

among them, a fire broke out on 4 June, and burned down the town. It is said that 150 ill of smallpox were removed to gardens, hedgerows and the arches of bridges, and that only one of the whole number died[1]. This is usually cited to show the benefits of fresh air; but if it be true, it shows more than that.

The Foundling Hospital may seem to offer all the conditions for a fair trial of the question. It had been a standing rule of the Governors, since the opening of the charity in 1749, that all children received into it should be inoculated. Sir William Watson, who states the fact, adds that he himself was "in a situation of superintending every year the inoculation of some hundreds." Still, the rule may not have been uniformly carried out; and even in this community of children, it was not always possible to learn on their admission whether they had had smallpox before in the natural way[2].

The lists of the inoculated are longer in the later periods than in the earlier: thus, from March, 1759 to May, 1766, the annual average is something under a hundred, the inmates having been 312 in 1763; but from May, 1766 to July, 1769, the annual average is some two hundred and fifty, the inmates in 1768 having been 438. Sir William Watson, in his essay upon the inoculations at the Foundling, breathes no hint that such a thing as natural smallpox ever happened there[3]; but in another context he does casually mention that there was an epidemic of sixty cases, with four deaths, in the end of 1762, and another epidemic in the following summer, of "many" cases, nineteen of which, with eleven fatalities, occurred in children who had lately been through the measles and were weakened in consequence[4]. Another epidemic, as I find by the apothecary's book of weekly admissions to the infirmary, happened in the winter of 1765–66, twenty-six names being entered as admitted for "natural smallpox." After that date all the great epidemics appear to have been of measles, whooping-cough, influenza or scarlatina; but almost every year smaller groups of "natural smallpox" occur, of which the following have been collected from the available records:

Foundling Hospital, London.

Year	Natural Smallpox	Year	Natural Smallpox
1766	8	1774	4
1767	2	1775	3
1768	8	1783	1
1769	7	1784	0
1770	1	1785	8 (or 16?)
1771	2	1786	0
1772	3	1787	5
1773	1	1788	4

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[1] Pulteney to Baker, App. to *Inquiry into the method of Inoculating.* 1766; Hutchins, *Dorsetshire*, I. 217.

[2] On 23 July, 1785, the apothecary makes a note in his book: "Some inspectors are not sufficiently careful to send information to the Hospital when children have had the smallpox." MS. Records.

[3] *Experiments, &c.* 1768.

[4] Sir W. Watson, M.D., F.R.S., "On the Putrid Measles of London, 1763 and 1768." *Med. Obs. and Inquiries*, IV. 153.

The occurrence of one or more cases seems to have been the signal for a general inoculation; or, again, it may be that the few cases of natural smallpox in the infirmary at one time had followed a general inoculation. Thus, in June–July, 1767, one case is entered on the second day from the inoculation (of a large number), and another on the fourth day. Again, in Nov.–Dec., 1768, one of the four cases of natural smallpox is marked "soon after his inoculation."

The received cases in which inoculation failed to save individuals from the natural smallpox are few. Besides those already given for the first period of the practice, and the case from Heberden, there are six fully detailed by Kite of Gravesend, in two groups of three each, all in the spring of 1790[1]. Apart from exact records, there are various testimonies more or less trustworthy. The Marquis of Hertford is said to have told Dr Jenner that his father, having been inoculated by Caesar Hawkins, the serjeant surgeon, and thereafter attended by him during a tour abroad, caught smallpox at Rheims and died[2]. Bromfeild, surgeon to Queen Charlotte, is said to have "abandoned the practice of inoculation in consequence of its failure[3]." Jenner and his friends made a collection of cases in which inoculation had failed, to the number of "more than one thousand, and fortunately seventeen of them in families of the nobility[4]." A Bath surgeon said he had heard of "innumerable" cases of attacks of natural smallpox long after inoculation, and had himself professionally seen "not a few[5]." A surgeon of Frampton on Severn knew of four cases, out of five inoculated together in 1784, that took smallpox afterwards in the natural way, of whom one died[6]. In an epidemic of smallpox at Enmore Green, a suburb of Shaftesbury, in 1808, a surgeon from Shaston found that "nearly twenty" of the victims had been inoculated "by the late Mr John White" about ten years before, and were supposed to have had it "very fine[7]." Dr John Forbes learned that some nineteen cases of natural smallpox in and around

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[1] Charles Kite, surgeon, Gravesend, "An Account of some anomalous Appearances consequent to Inoculation of Smallpox." *Memoirs Med. Soc. Lond.* IV. (1794), p. 114.

[2] Fosbroke, *Lond. Med. Repository.* June, 1819, p. 466.

[3] Jenner to James Moore, in Baron's *Life of Jenner*, II. 401: "Is not that a precious anecdote for your new work?" See also *Court and Private Life of Queen Charlotte* (Journals of Mrs Papendiek). Lond. 1887, I. 41, 70, 270.

[4] In Baron, u. s.

[5] *A Conscious View, &c.* u. s.

[6] Earle, in Jenner's *Further Observations.* 1799.

[7] T. Adams to Richard Pew, M.D., of Sherborne. *Lond. Med. and Phys. Journ.* April, 1829.

Chichester in 1821–22 were of inoculated persons[1]. It would be incorrect to say that such cases could be multiplied indefinitely; on the contrary, they are hard to find. Whether that shows that inoculation was on the whole a success, to the extent that it was tried, or that its failures are in part unrecorded, I am not competent to decide. But it cannot be doubted that the usual estimates of the saving of life by inoculation were extravagant and fallacious. La Condamine, a mathematician, counted up the saving to the slave-owner in an ideal plantation of three hundred negroes[2]. Watson, with the epidemics in the Foundling fresh in his memory, estimated that inoculation might have saved 23,000 out of the 23,308 who had died of smallpox in London in ten years, 1758–68[3]. Haygarth[4] reckoned that 351 might have been saved by inoculation of the 378 children who died of smallpox at Chester from 1772 to 1777. Woodville, who wrote the history of inoculation down to the advent of Sutton, declared in 1796 that the art of inoculation, originally a fortuitous discovery, "is capable of saving more lives than the whole *materia medica*[5]." Arnot, the historian of Edinburgh (1779), asserted inoculation to be "a remedy so compleat that we hesitate not in the least to pronounce those parents, who will not inoculate their children for the smallpox, accessory to their death[6]." The College of Physicians, in a formal minute of 1754, pronounced it "highly salutary to the human race."

Despite all those academic pronouncements, inoculation was somehow not a practical success. It cannot be maintained that it failed because the people were averse to it; for it continued to be in popular request far into the 19th century, until it was at length suppressed by statute. For the present we may return to the proper subject of epidemic smallpox, premising, on the ground of what has been said, that inoculation made but little difference to the epidemiological history.

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[1] John Forbes, M.D., "Some Account of the Smallpox lately prevalent in Chichester and its vicinity." *Lond. Med. Reposit.* Sept. 1822, p. 218.

[2] *Discourse on Inoculation.* Eng. Transl. 1755.

[3] *A Series of Experiments, &c.* 1768.

[4] John Haygarth, M.B., *Inquiry how to prevent the Smallpox.* Chester, 1784, p. 154.

[5] *History of Inoculation in Britain.* Vol. I. London, 1796, p. 33.

[6] *History of Edinburgh.* Edin. 1779, p. 260.

The Epidemiology continued from 1721.

The ordinary course of smallpox in Britain was little touched by inoculation. The inoculators were like the fly upon the wheel, with the important difference that they did indeed raise the dust. The writers who kept up the old Hippocratic or Sydenhamian habit of recording the prevalent maladies of successive seasons, such as Huxham, Hillary[1], and Barker, of Coleshill, while they dealt with epidemics impartially and comprehensively, were as if by a common instinct adverse to the fuss made about inoculation. Says Barker, in an essay against inoculation during the Suttonian enthusiasm, "It is undoubtedly a great error that the smallpox is now considered the only bugbear in the whole list of diseases, which, if people can get but over, they think they are safe." This hits fairly enough the disproportionate share given to inoculation in the medical writings of the time, while it is made more pointed by the author's suggestions for a scientific study of the conditions of smallpox itself[2]. It is still possible, with much trouble, to bring together the data for a scientific handling of the disease in the 18th century, thanks most of all to the exact school of observers or statisticians which began with Percival, of Manchester, and was continued to the end of the century by Haygarth, Heysham, Ferriar, Aikin and others. The best of the original English inoculators, Nettleton of Halifax, has also left a large number of interesting statistics relating to epidemics in Yorkshire and other northern counties in the years 1721–23; also, upon his suggestion, the figures were procured from many more smallpox epidemics in other parts of England down to 1727. It will be convenient to resume the history with these, as they come next in order after the London epidemic of 1720, at which point the interlude of inoculation came in. The following is a complete table of the figures collected from various sources: it will be observed that most parts of England are represented, the fullest representation being of the northern counties.

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[1] W. Hillary, *Rational and mechanical Essay on the Smallpox.* Lond. 1735.

[2] J. Barker, *The Nature of Inoculation explained and its Merits stated.* London, 1769, p. 33. He taught that a depraved habit, by ill diet, &c., "serves for a nidus wherein the variolous matter rests." If the variolous matter to be expelled is small, "by reason of natural health, temperance, or the power of preparation," the disease is of the distinct kind; when large, of the confluent. "And wise indeed must he be who can find out any laws respecting the reception and expulsion of diseases superior on the whole to those which are original." p. 9.

Censuses of Smallpox Epidemics in England, 1721–30.

Locality of the Epidemic	Period	Authority	Cases	Deaths	Percentage of Fatalities
[1] Halifax	winter of 1721 to April 1722	Nettleton, *Phil. Trans.* XXXII. 51	276	43	15·9
[2] Rochdale	"	"	177	38	21·4
[3] Leeds	"	"	792	189	23·8
Halifax parish towards Bradford	1722	*Ibid.* p. 221	297	59	19·9
Halifax parish, another part	"	"	268	28	10·4
Bradford	"	"	129	36	27·9
Wakefield	"	"	418	57	13·6
[4] Ashton under Lyne	"	"	279	56	20·0
Macclesfield	"	"	302	37	12·2
Stockport	"	"	287	73	25·4
Hatherfield	"	"	180	20	11·1
[5] Chichester	1722 (to 15 Oct.)	Whitaker, *Ibid.* p. 223	994	168	16·9
Haverfordwest	1722	Perrot Williams, *Ibid.*	227	52	22·9
Barstand, Ripponden, Sorby, and part of Halifax parish 4 miles from the town	"	Nettleton, in Jurin's *Acct.* for 1723, p. 7	230	38	16·5
Bolton	1723?	Jurin's *Acct.* for 1723, p. 8	406	89	21·6
Ware	"	"	612	72	11·7
Salisbury	"	"	1244	165	13·2
Rumsey, Hants	"	"	913	143	15·6
Havant	"	"	264	61	23·1
Bedford	"	"	786	147	18·4
Shaftesbury	1724?	*Ibid.* for 1724, p. 12	660	100	15·1
Dedham, near Colchester	"	"	339	106	31·3
Plymouth	"	"	188	32	17·2
Aynho, near Banbury	27 Sept. 1723 to 29 Dec. 1724	Rev. Mr Wasse, rector, *Ibid.* for 1725, p. 55	133	25	18·8
Stratford on Avon	"	Dr Letherland, *Ibid.*	562	89	15·8
Bolton le Moors	"	Dr Dixon, *Ibid.*	341	64	18·8
Cobham	"	Sir Hans Sloane, *Ibid.*	105	20	19·0

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[1] "I have taken an account in this town [Halifax], and some parts of the country, and have procured the same from several other towns hereabouts, where the smallpox has been epidemical this last year, with as much exactness as was possible." *Phil. Trans.* XXXII. 211.

[2] "A small neighbouring market town."

[3] "More than usually mortal."

[4] "A small market town in Lancashire, including two neighbouring villages."

[5] Account taken "by a person of credit" and sent to Dr Whitaker. Jurin says, more generally: "Taken in several places by a careful enquiry from house to house." *Account, &c.* 1724, p. 7.

Locality of the Epidemic	Period	Authority	Cases	Deaths	Percentage of Fatalities
Dover	29 Sept. 1725 to 25 Dec. 1726	Dr Lynch of Canterbury, in Jurin's *Acct.* for 1726, p. 17	503	61	12·1
Deal	25 Dec. 1725 to 29 Nov. 1726	„	362	33	9·1
Kemsey, near Worcester	„	Dr Beard, in Jurin, *Ibid.*	73	15	20·5
[1] Uxbridge	1727	Dr Thorold, in Scheuchzer's *Acct.* for 1727 and 1728	140	51	36·4
Hastings	1729–30	Dr Frewen, *Phil. Trans.* XXXVII. 108	705	97	13·7

The years 1722 and 1723, to which most of these epidemics belong, were one of the greater smallpox periods in England. In Short's abstracts of the parish registers those years stand out very prominently by reason of the excess of deaths over births in a large proportion of country parishes (see above, p. 66); and, according to Wintringham's annals, it was not fever that made them fatal years, but smallpox, along with autumnal dysenteries and diarrhoeas. Of one epidemic centre in the winter of 1721–22, which is not in the table, the district of Hertford, we obtain a glimpse from Maitland, who repaired thither from London to practise inoculation.

> "I own that it seem'd probable that the six persons in Mr Batt's family might have catched the smallpox of the girl that was inoculated; but it is well-known that the smallpox were rife, not only at Hertford but in several villages round it, many months before any person was inoculated there: witness Mr Dobb's house in Christ's Hospital buildings, where he himself died of the worst sort with purples, and his children had it; some other families there, and particularly Mr Moss's, (where the above-named Elizabeth Harrison, inoculated in Newgate, attended several persons under it to prove whether she would catch the distemper by infection); both Latin boarding-schools, Mr Stout's and Mr Lloyd's families, Mr John Dimsdale's coachman and his wife, and Mr Santoon's maid-servant, who was brought to the same house and died of the confluent kind of the smallpox[2]."

Here we have the same indication of adults attacked as well as children, which we find in Dover's practice in London in 1720 and in all the 17th century and early 18th century references to smallpox. The most detailed account is that

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[1] "At Uxbridge and in the neighbourhood, the smallpox having been exceedingly fatal all thereabouts."

[2] *Mr Maitland's Account of Inoculating the Smallpox vindicated.* 2nd ed. Lond. 1722.

given for the epidemic of 1724–25 at Plymouth by Huxham, who was not an inoculator but purely an epidemiologist and practitioner in the old manner.

The epidemic was a very severe one and of an anomalous type. Adults, according to his particular references and his general statement, must have been freely attacked. The major part of the adult cases, he says, proved fatal, including one of an old gentlewoman of 72,—"a very uncommon exit for a person of her years"! When the disease raged most severely, some children had it very favourably and required no other physic than to be purged at the end of the attack. The pustules were apt to be small and to remain unfilled. In some there were miliary vesicles, dark red or filled with limpid serum, in the interstices between the smallpox pustules. Some had abundance of purple petechiae among the pocks, the latter also being livid. Only one person survived of all who had that haemorrhagic type. Swelling of the face and throat was also seldom recovered from; in such cases that did well, the maxillary and parotid glands would remain swollen for some time. "It was a remarkable instance of the extraordinary virulence of these smallpox that the women (tho' they had had the smallpox before and some very severely too) who constantly attended those ill of the confluent kind, whether children or grown persons, had generally several pustules broke out on their face, hands and breast....I knew one woman that had more than forty on one side of her face and breast, the child she attended frequently leaning on those parts on that side."

Huxham appears to have adopted the whole Sydenhamian practice of blooding, blistering, purging, and salivating. For the last he used calomel: "Two adults and some children in the confluent sort never salivated. Some very young children drivelled exceedingly through the course of the distemper. A diarrhoea very seldom happened to children[1]."

Corresponding very nearly in time to Huxham's malignant and anomalous constitution of smallpox at Plymouth, and agreeing exactly with his generalities as to children and adults, there is an interesting table of the ages and fatalities of those who were attacked at Aynho, in Northamptonshire, six miles from Banbury. It was then a small market town, and its smallpox for some fifteen months of 1723–24, as recorded by the rector of the parish, may be taken as a fair instance of what happened at intervals (usually long ones) in the rural districts in the earlier years of the 18th century[2]:

Ages	0–1	–2	–3	–4	–5	–10	–15	–20	–25	–30	–40	–50	–60	–70	above 70	Total
Cases	0	0	3	4	6	15	33	14	16	9	12	10	4	4	2	132
Deaths	0	0	2	1	0	1	3	1	3	3	3	4	1	2	1	25

The small fatality of the disease between the ages of five years and twenty is according to the experience of all times.

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[1] *Phil. Trans.* XXXIII. 379. "A short account of the Anomalous Epidemic Smallpox beginning at Plymouth in August, 1724, and continuing to the month of June, 1725, By the learned and ingenious Dr Huxham, physician at Plymouth."

[2] The totals are given in Jurin's *Account* for 1725. The ages are in the original communication of the Rev. Mr Wasse, among the MS. papers which Jurin had deposited with the Royal Society.

But the considerable proportion of attacks at the higher ages would hardly have been found anywhere in England, not even in a country parish, a generation or two later, although it is consistent with all that is known of smallpox in the 17th century and in the first years of the 18th[1].

Another glimpse of a prolonged smallpox epidemic of the same period in a town is given in Frewen's census of Hastings, with a population of 1636 (males 782, females 854). The disease was prevalent for about a year and a half, and had ceased previous to 28 January, 1732[2]. The table accounts for the whole population:

The number of those that recovered of the smallpox (including four that were inoculated)	608
Died of it	97
Escaped it	206
Died of other diseases since the smallpox raged there	50
The whole number of inhabitants in that town are	1636

Leaving out the fifty who died of other diseases as persons who may or may not have had smallpox, it appears that 725 of the inhabitants of Hastings had been through the smallpox in previous epidemics, that 705 were attacked in this epidemic, and that 206 had hitherto escaped, some of them to be attacked, doubtless, in the future. The proportion of attacks above the age of childhood in the epidemic of 1730–31 would have depended on the length of time since the last great epidemic; the interval was probably a long one, by the large number of susceptible persons in the town, just as at Boston, Massachusetts, in 1721 and 1752, and at Charleston, Carolina, in 1738[3]; and, as the fact is known for these places, so it is probable that the epidemic at Hastings had included many adolescents and adults.

On the other hand, where smallpox came in epidemics at short intervals, or where it was always present, the incidence,

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[1] The most singular thing in the Aynho experience is that there should have been no cases in infants under two years. It was observed, however, some two generations after this, that smallpox attacked children at the earliest ages in the great towns (Haygarth, *Sketch of a Plan, &c.*, 1793, p. 31), and even in the worst conditions of infancy it has attacked relatively few in the first three months of life. Again, it is nearly as remarkable that there should have been only three cases at Aynho in the third year of life and only four in the fourth. However, the fewness of cases in the five first years of life must be taken as exceptional, even for a village epidemic. If Nettleton, who made the first of these censuses of smallpox epidemics and suggested to Jurin that they should be carried out elsewhere, had given the ages, he would certainly have included some in infancy, for he mentions, in the course of his inoculation experiences, particular cases at nine months, eighteen months, etc.

[2] Frewen, *Phil. Trans.* XXXVII. 108.

[3] See above, pp. 485–6 and 490–1.

even in the first half of the 18th century, was much more exclusively upon childhood. Thus at Nottingham there was always some smallpox, with a great outburst perhaps once in five years. The year 1736 was one of those fatal periods of smallpox, the victims being "mostly children." From the end of May to the beginning of September, great numbers were swept away; the burials in St Mary's churchyard were 104 in May; the burials from all causes for the whole year exceeded the baptisms by 380; there had been no such mortality since thirty years. Such excessive incidence of smallpox upon the earliest years of life happened in places where the infant mortality was high from all causes. Nottingham was one of those places. Leaving out the great smallpox year, 1736, the other seven years of the period 1732–39 had a total of 2590 baptisms to 2226 burials, of which burials no fewer than 1072 were of "infants," meaning probably children under five years, although the work of Harris on the Acute Diseases of Infants, which was current at that time, defines the infantine age as under four years[1].

The years of distress and typhus fever in England, Scotland, and Ireland from 1740 to 1742 were another great period of smallpox epidemics throughout the country. The mortality from that cause is known to have been excessive in Norwich, Blandford, Edinburgh and Kilmarnock, which may be taken as samples of a larger number of epidemics in the same years. The association of much smallpox of a fatal type with much typhus fever, which can be traced in the London bills from an early period, is at length seen to be the rule for the country at large. After 1740–42, the next instances of it were in 1756 and 1766: it is most definitely indicated again in 1798–1800, very clearly in 1817–19, and in 1837–39. In all the later instances smallpox was the peculiar scourge of the infants and children in times of distress, while the contagious fever was as distinctively fatal to the higher ages. There is some reason to think that the law of incidence was the same in populous cities in 1740–42.

Thus at Edinburgh there died in the two worst years of the distress (population in 1732 estimated at 32,000)[2]:

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[1] Deering, *Nottingham vetus et nova.* 1751, pp. 78, 82. He says, in an essay on smallpox (*Improved Method of treating Smallpox.* Nottingham, 1737) that he treated fifty-one cases in the epidemic of 1736, of which only three proved fatal.

[2] *Gent. Magaz.* 1741, p. 704.

Edinburgh Mortalities.

	1740	1741
Under two years	439	562
From two to five	198	269
From five to ten	53	93
Above ten	547	687
	1237	1611
Fever	161	304
Flux	3	36
Consumption	278	349
Aged	102	156
Suddenly	56	62
Smallpox	274	206
Measles	100	112
Chincough	26	101
Convulsions	22	16
Teething	111	141
Stillborn	29	50
Other diseases	77	78

More than half the deaths were under five years, and among those deaths it will be necessary to include most of the smallpox mortality. That disease in the two exceptional years made 17 per cent. of all deaths, or one in six. But in its somewhat steady prevalence among children in Edinburgh from year to year, smallpox accounted for one death in about ten, as in the following[1]:

Deaths by Smallpox and all causes in Edinburgh, including St Cuthbert's parish, 1744–63.

Year	All Burials	Dead of Smallpox	Year	All Burials	Dead of Smallpox
1744	1345	167	1754	1215	104
1745	1463	141	1755	1187	89
1746	1712	128	1756	1316	126
1747	1200	71	1757	1267	113
1748	1286	167	1758	1001	52
1749	1132	192	1759	1136	232
1750	1038	64	1760	1123	66
1751	1241	109	1761	903	6
1752	1187	147	1762	1305	274
1753	1105	70	1763	1160	123
	12709	1256 or 1 in 9·6		11613	1185 or 1 in 9·8

As in other epidemics, it was not until its second year that the smallpox reached Norwich. The mortality had been enormous

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[1] Alex. Monro, primus, in his Report to the Dean of the Faculty of Medicine of Paris on Inoculation in Scotland, 1765. Reprinted in his *Works.* Edin. 1781, p. 485. He does not give ages, but an inspection of the burial registers is said to show that they were nearly all under five.

in 1741, owing to the distress and the fever, 1456 burials to 851 baptisms; but in 1742 the burials were 1953 (to 825 baptisms), the excess over the previous year being ascribed, in general terms, to the smallpox[1]. It is probable that the enormous excess of burials over baptisms at Newcastle in 1741 was due in great part to the same disease among the children; but the statistics do not show it.

Northampton is an instance of a town with very moderate mortality for the 18th century; for that and other reasons its bills were used by Price as the basis of a table of the expectation of life. It had certainly shared in the fever epidemic of 1741 and 1742, for in the latter of those years the annual bill shows the very high fever-mortality of 37 in 130 deaths from all causes in All Saints' parish, which had fully one-half of the population. But in that year there are no smallpox deaths recorded, and only nine in the next four years. The great periodic outburst of smallpox came in 1747[2]:

Smallpox in Northampton, 1747.

Parish	Cases	Deaths	Percentage of Fatalities
All Saints	485	76	15·6
St Sepulchre	175	21	12·0
St Giles	131	23	17·5
St Peter	30	6	20·0
	821	126	15·3 or 1 in 6·5

Of the 76 deaths in All Saints' parish only 58 were buried there. The deaths from all causes in that parish were 189, of which 103, or 54 per cent., were under five years of age, and 10 between five and ten years. Next year, when things had improved much, although the mortality was still high, All Saints' parish had 119 burials, of which 47, or 40 per cent., were under five years, and 4 from five to ten, only three of the deaths being from smallpox. Only a few smallpox deaths appear in the bills of All Saints' parish until 1756 and 1757, when an epidemic occurred, part of it in each year, which produced in that greatest of the four parishes 85 burials, or half as many again as

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[1] *Gent. Magaz.* 1742, p. 704. Blomefield gives 1710 and 1731 as great smallpox years in Norwich.

[2] *Ibid.* 1747, p. 623. The population of Northampton in 1746 was 5136. Price, *Revers. Payments.* 4th ed. I. 353.

in the epidemic of ten years before. It is singular that the deaths under and over five are in a very different ratio in the two successive years of the epidemic:

All Saints' Parish, Northampton.

	1756	1757
All deaths	140	135
Smallpox deaths	31	54
All deaths under 2	54	24
,, ,, 2—5	12	18
,, ,, 5—10	7	21
,, ,, 10—20	5	6
,, ,, 20—30	13	18
,, ,, 30—40	7	12
,, ,, 40—50	4	5
,, ,, above 50	38	31

This looks as if a good many more had died of smallpox at the higher ages in the second year of its prevalence than in the first; but the great difference between the deaths under two in 1756 and 1757 is explained chiefly by the article "convulsions," which is 28 in the former year and only 10 in the latter.

In Boston, Lincolnshire, a town almost as healthy as Northampton, the intervals between epidemics of smallpox were almost as long, and the effect in raising the mortality for the year nearly the same. The population in the last year but one of the table was 3470. The deaths averaged 104 in a year, the smallpox deaths 9·45, or one in eleven[1].

Smallpox in Boston, Lincolnshire, 1749–68.

Year	Baptised	Buried	Died by Smallpox
1749	68	120	48
1750	80	93	—
1751	55	59	—
1752	88	85	—
1753	79	73	—
1754	88	111	1
1755	74	102	19
1756	66	110	34
1757	93	86	4
1758	83	88	4
1759	102	91	—
1760	106	84	2
1761	80	94	—
1762	95	134	3
1763	92	206	69
1764	130	102	5
1765	112	113	—
1766	144	117	—
1767	129	95	—
1768	131	117	—

[1] Part of the account extracted from the parish registers by the Rev. Samuel Partridge, F.S.A., vicar of Boston, and sent to Dr George Pearson, who published it in the *Report of the Vaccine Pock Institution for* 1800–1802. London, 1803, p. 100.

This was a favourable instance of urban smallpox in the 18th century, Boston having "no circumstances of narrow streets, crowded houses, manufactories or want of medical assistance." We may compare with it an industrial town only a little larger, the weaving town of Kilmarnock, Ayrshire, the smallpox epidemics of which came as follows[1]:

Smallpox in Kilmarnock, 1728–63.

Year	Baptised	Buried	Died by Smallpox
1728	111	162	66
1729	—	—	—
1730	—	—	—
1731	—	—	—
1732	—	—	—
1733	—	—	45
1734	—	—	—
1735	—	—	—
1736	135	147	66
1737	—	—	—
1738	—	—	—
1739	—	—	—
1740	95	164	66
1741	—	—	—
1742	—	—	—
1743	—	—	—
1744	—	—	—
1745	116	102	74
1746	—	—	8
1747	—	—	—
1748	—	—	2
1749	134	149	79
1750	—	—	5
1751	—	—	1
1752	—	—	—
1753	—	—	1
1754	146	203	95
1755	—	—	—
1756	—	—	—
1757	125	132	37
1758	—	—	9
1759	—	—	—
1760	—	—	—
1761	—	—	—
1762	132	173	66
1763	—	—	2

Although Kilmarnock had an average annual excess of baptisms over burials (134 to 107), which was more than that of Boston, its smallpox mortality was higher than that of the Lincolnshire market town. On an annual average, one death in eleven from all causes was by smallpox at Boston, one in six at Kilmarnock. In the former the epidemics came at intervals of about five years, in the latter at intervals of three or four. The oftener the epidemic came, the earlier in life it attacked children; and in all subsequent experience it has been found that smallpox is far more mortal to the ages below five than to the ages from five to ten or fifteen. More generally, the conditions were worse for young children in a weaving town than in a market town of nearly the same size. In the populous

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[1] J. C. M'Vail, M.D. in *Proc. Philos. Soc. Glasgow*, XIII. 1882, p. 381, from a MS. register kept by the session clerk of Kilmarnock, now in the General Register House, Edinburgh. The baptisms and burials have not been extended from the MS. for more years than the table shows.

weaving parish of Dunse, 130 children are said to have died of smallpox in 1733, during a space of three months[1].

The ages at which deaths from smallpox occurred in Kilmarnock from 1728 to 1763 are strikingly different from those already given for the small market town or village of Aynho, near Banbury, in 1723–24; at the latter the greater part of the fatalities, although not of the attacks, happened to persons between twenty and fifty; at the former nine-tenths of the deaths were of infants and young children, as in the following:

Ages at Death from Smallpox, Kilmarnock, 1728–63.

Deaths at all ages	Under One	One to Two	Two to Three	Three to Four	Four to Five	Five to Six	Above Six	Age not stated
622	118	146	136	101	62	23	27	9

This almost exclusive incidence of fatal smallpox upon infants and young children in a weaving town during the middle third of the 18th century we shall find abundantly confirmed for English manufacturing and other populous towns in the last third of the 18th century, and thereafter until the middle of the 19th century. On the other hand, the less populous towns and the country districts continued in the 18th century to furnish a fair share of adult cases, for the reason that epidemics came to them at longer intervals, wherein many had passed from infancy to childhood, and even from childhood to youth or maturity, without once encountering the risk of epidemic contagion.

Of such less populous places we have an instance in Blandford, Dorset. Particulars of its smallpox have been given in connexion with general inoculations; here let us note that in this typical market town of 2110 inhabitants (in 1773), the known epidemics were in 1731, 1741, 1753 and 1766—at intervals of ten or a dozen years. In the villages the intervals were longer. Haygarth gives the instance of three parishes in Kent with only ten deaths from smallpox in twenty years, and of Seaford, in Sussex, with one death "eleven years ago[2]." An authentic instance is the parish of Ackworth, Yorkshire, whose register of burials contains only one smallpox death in the ten years 1747–57, while there are thirteen such deaths in it in the next ten-

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[1] *Statist. Acct. of Scotland.*

[2] *Sketch of a Plan, &c.* 1793, pp. 33–34.

years period, clearly the effects of an epidemic, perhaps in 1766[1]. This parish, judged by the excess of births, was not so healthy as many[2], while its mortality by "fevers" was considerable. The following somewhat general statements are made for the parish of Kirkmaiden, Wigtonshire[3]:

1717. "Nearly thirty-seven died of the smallpox."
1721. Forty-eight died, "mostly of fevers."
1725. Forty-three died, "mostly of the smallpox."

By means of this law of periodic return, at short intervals in the populous industrial towns, at longer intervals in the market towns, and at very long intervals in the villages, we may realize in a measure what smallpox was at its worst. It was the great infective scourge of infancy and childhood, admitting but few or feeble rivals or competitors, as we shall see in the historical accounts of measles, whooping-cough and scarlatina. The table of epidemics from 1721 to 1727, given at p. 518, is of a kind that might have been furnished by any series of years in the 18th century; they were so much of a commonplace that hardly anyone thought of chronicling them unless for a special statistical purpose, such as the inoculation controversy. Thus, the Salisbury epidemic of 1723, with 1244 cases and 165 deaths, must have been only one of a series at intervals, which may or

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[1] The following is the Ackworth bill given by Price, *Phil. Trans.* LXV. 443.

	1747–57	1757–67
Christened	127	212
Buried	107	156
Consumption	23	38
Dropsy	5	3
Fevers	35	23
Infancy	13	13
Old age	24	30
Smallpox	1	13
Chincough	—	2
Convulsions	—	6
Dysentery	—	2
Measles	—	2
Sundries	6	24
Total deaths in ten years	107	156

[2] The following are some examples of rural fecundity and health: Middleton, near Manchester, 1763–72, births 1560, deaths 993, average of 4·75 children to a marriage. Tattenhall, near Chester, 1764–73, births 280, deaths 130; Waverton, same county and years, births 193, deaths 84. Stoke Damerel (now the dockyard near Plymouth), in 1733 (in part an influenza-year), births 122, deaths 62, population 3361. Landward townships of Manchester in 1772, births 401, deaths 246. Darwen, in 1774–80, births 508, deaths 233, population 1850. From Papers in *Phil. Trans.* by Percival and others.

[3] *Statist. Acct. of Scot.* I. 155.

may not have become more frequent, or of different age-incidence, or of more fatal type, as the century proceeded. We have a glimpse of one of them in 1752–3. Lord Folkestone having given a hundred pounds to the poor of Salisbury, it was ordered on 15 December, 1752, "that five shillings be given to every inhabitant who hath had the smallpox in the natural way since 1 September, or that shall have it hereafter." The epidemic went on for months; it was not until the end of 1753 that the mayor advertised the city free of smallpox. In September of that year ten guineas were voted to Mr Hall, the apothecary, for his trouble during the smallpox, and a like sum to Mr Dennis, the surgeon[1].

The year 1753 was also the time of one of the periodical Blandford outbreaks. For a year or two before there had been much smallpox at Plymouth, the account of which by Huxham will serve as a sample of his numerous references to the disease there from the beginning of his annals in 1728.

> In May, 1751, smallpox was brought in by Conway's regiment; it spread in July and August, becoming worse in type in the autumn as it became more common. In January 1752 it was still prevalent, the pustules often crude, crystalline, undigested to the end; sometimes very confluent, small and sessile; sometimes black and bloody, attended now and then with petechiae. In March the type grew more mild; in April the malady was still up and down, some cases being of a bad sort. It became more frequent again in June, and was epidemic all the summer, the eruption often confluent, small, sometimes black, with haemorrhages from the nose, especially in children. In August it was epidemic everywhere, and more fatal, becoming milder in September and October. In December, "the crusts of the black confluent kind many times remained for at least thirty days after the eruption." It declined from January, 1753, and entirely ceased in May, having had a prevalence of two years[2].

Smallpox in London in the middle of the 18th century.

There is hardly any epidemic malady in London of which so few particular records remain as of smallpox, except in the bills of mortality. The monthly notes in the *Gentleman's Magazine* from 1751 to 1755 by Dr Fothergill, who practised at that time in White Hart Court, Lombard Street (having afterwards removed westward to Harpur Street, Red Lion Square), contain the following references to it:

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[1] Hoare's *Wiltshire*, VI. 521. There had been a general inoculation to the number of 422, from 13 August, 1751, to February, 1752, just before the epidemic. Brown to Watson, in *Phil. Trans.* XLVII. 570.

[2] Huxham, *Ulcerous Sore-throat*, 1757.

1751, May. Smallpox uncommonly mild in general, few dying of it in comparison of what happens in most years.

1751, December. Smallpox began to make their appearance more frequently than they had done of late, and became epidemical in this month. They were in general of a benign kind, tolerably distinct, though often very numerous. Many had them so favourably as to require very little medical assistance, and perhaps a greater number have got through them safely than has of late years been known.

1752, January. A distinct benign kind of smallpox continued to be the epidemic of this month....A few confluent cases, but rarely. February—Children and young persons, unless the constitution is very unfavourable, get through it very well, and the height to which the weekly bills are swelled ought to be considered in the present case as an argument of the frequency, not fatality, of this distemper.

1752, April. Smallpox continued to be the principal epidemic, as in the preceding months; during which time it attacked most of those who had not hitherto had the distemper, and it is now spread into the suburbs and the neighbouring villages, but still in a favourable way in general. Some have the confluent, a few the bleeding kind, but these are not very common.

1752, June. Smallpox still continues, not many escaping who have not had it before.

1752, July. Smallpox inclined to become malignant, but the constitution on the whole remarkably mild. Children from one to three years old have, I believe, suffered more from the distemper during this constitution than those of any other ages; at least it has so fallen out under the writer's observation.

1753, December. Smallpox of a bad type.

1754, August. Smallpox frequent in many parts of the City, and eastern suburbs especially. In general the kind was mild, distinct and favourable. Out of sixteen who had the disease in a certain district, of different ages, one only died. In some it was very virulent, with livid petechiae.

1754, December. Smallpox not unfrequent. Many had the worst kind seen for years.

1755, January. Smallpox more favourable.

Fothergill, who pointed out the defects of the London bills of mortality and made a serious attempt to get them reformed[1], was disposed to take their figures of smallpox deaths as on the whole trustworthy: "The smallpox, of all diseases mentioned in the weekly bills, is perhaps the only one of which we have any tolerably exact account, it being a disease which the most ignorant cannot easily mistake for another." Reserving this opinion for some critical remarks in the sequel, we may now resume the London statistics from the year last given.

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[1] *Gent. Magaz.* 1751, Supplement, p. 577. See also June, 1751, p. 244, and letter of "Devoniensis," *ibid.* 1752, p. 159. The subject had been raised by Corbyn Morris in his *Observations on the past growth and present state of London*, and was discussed, from an actuary's point of view, by Dodson in *Phil. Trans.* XLVII. (Jan. 1752), p. 333.

Smallpox Mortality in London, 1721–60.

Year	Deaths from smallpox	Deaths from all causes
1721	2,375	26,142
1722	2,167	25,750
1723	3,271	29,197
1724	1,227	25,952
1725	3,188	25,523
1726	1,569	29,647
1727	2,379	28,418
1728	2,105	27,810
1729	2,849	29,722
1730	1,914	26,761
1731	2,640	25,262
1732	1,197	23,358
1733	1,370	29,233
1734	2,688	26,062
1735	1,594	23,538
1736	3,014	27,581
1737	2,084	27,823
1738	1,590	25,825
1739	1,690	25,432
1740	2,725	30,811
1741	1,977	32,169
1742	1,429	27,483
1743	2,029	25,200
1744	1,633	20,606
1745	1,206	21,296
1746	3,236	28,157
1747	1,380	25,494
1748	1,789	23,069
1749	2,625	25,516
1750	1,229	23,727
1751	998	21,028
1752	3,538	20,485
1753	774	19,276
1754	2,359	22,696
1755	1,988	21,917
1756	1,608	20,872
1757	3,296	21,313
1758	1,273	17,576
1759	2,596	19,604
1760	2,181	19,830

The year 1752, to which Fothergill refers most fully in the notes cited, had the highest total of deaths from smallpox in the period 1721–60, namely, 3538, and was exceeded by only two years in the latter part of the century, 1772, with 3992 deaths and 1796 with 3548. Fothergill says twice that the disease in 1752 was on the whole mild, but so universal that not many escaped it who had not had it before; and that children from one to three years suffered most from it. As the year was not

an unhealthy one in general, this epidemic of smallpox may be chosen to show its effect upon the weekly mortalities, of children in particular.

London Weekly Mortalities: Smallpox Epidemic of 1752.

Week ending		All deaths	Under two years	Two to five	Five to ten	Smallpox deaths	Convulsions deaths
March	3	438	162	54	19	64	113
	10	441	165	40	16	63	116
	17	477	177	56	15	76	110
	24	456	161	61	19	87	111
	31	471	169	62	8	96	117
April	7	500	185	58	14	87	129
	14	431	144	52	27	76	99
	21	397	145	37	18	77	106
	28	458	161	47	25	94	98
May	5	421	133	52	17	81	85
	12	414	140	62	24	93	101
	19	461	235	52	20	119	104
	26	456	157	66	24	120	92
June	2	452	159	65	28	125	98
	9	415	172	51	17	113	87
	16	421	165	56	20	120	98
	23	380	160	57	15	102	82
	30	353	127	52	19	92	74
July	7	390	142	68	19	107	87
	14	339	142	44	12	79	98
	21	351	144	38	23	73	97
	28	368	168	53	14	92	93
Aug.	4	316	141	37	13	72	90
	11	350	155	44	13	58	99
	18	297	145	26	9	43	98
	25	371	168	46	12	57	109

The weeks with highest smallpox mortalities have not always the highest deaths from all causes; but they correspond to a marked rise of the deaths from two to five years. If the table were continued to the end of the year, to show the decline of smallpox to a fourth or fifth of its highest weekly figures, the decline in the deaths from two to five, as well as from five to ten, would be seen to correspond more strikingly[1]. The other notable suggestion of the figures is that the article "convulsions," which included at that time nearly the whole of infantile diarrhoea, is not so high as usual when the article smallpox rises most. The highest weekly deaths from convulsions are in the first months of the year, when the smallpox epidemic was beginning, and in September and October, the season of

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[1] The weekly average deaths for eight weeks of September and October is 30·5 from two to five years and 11·1 from five to ten, which are about half the average at each age period during the maximum prevalence of smallpox.

infantile diarrhoea, when the smallpox epidemic was nearly spent.

The ages at which persons died in the several diseases were not given in the Bills, although they were recorded in the books of Parish Clerks' Hall; so that the incidence of smallpox mortality upon infants and young children cannot be proved for the capital as it can for other great towns in the 18th century. Not only can it not be proved, but it was not the fact that the disease was so exclusively an affair of childhood as it was in the populous provincial centres. The London population was peculiar in receiving a constant recruit direct from the country. Many of them came from parishes where, as Lettsom says, "the smallpox seldom appears"; they must often have passed their childhood without meeting with it, to encounter the risk when they came to London[1]. Many of the class of domestic servants were in that position; and it was especially for them that the London Smallpox Hospital existed, the admission to it being by subscribers' letters, as in the voluntarily supported hospitals at present.

Its small accommodation was given up to some extent also to persons in exceptionally distressed circumstances[2]. From its opening on 26 September, 1746, to 24 March, 1759, it had admitted 3946 cases, of which 1030 had died; these are stated in the annual reports to have been "mostly adults, in many cases admitted after great irregularities and when there was little hope of a cure"; so that the practice of this hospital alone may be taken as evidence of several hundreds of adult cases of smallpox in the year in London (the whole annual cases averaging perhaps twelve thousand).

The exact statistics which we shall come to in a later period of the century, for Manchester, Chester, Warrington and Carlisle, show that nearly all the deaths by smallpox were under five

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[1] W. Black, M.D. (*Observations Medical and Political on the Smallpox, etc.* London, 1781, p. 100) says: "I am induced by various considerations to believe that whatever share of smallpox mortality takes place in London amongst persons turned of twenty years of age, is almost solely confined to the new annual settlers or recruits, who are necessary to repair the waste of London, and the majority of whom arrive in the capital from twenty to forty years of age."

[2] Maddox, bishop of Worcester, preaching a sermon in 1752 for the Smallpox and Inoculation Charity, enforced his pleading by relating the recent case of "a poor man sick of this distemper, of which his wife lay dead in the same room, with four children around her catching the dreadful infection, but destitute of all relief, till they found *some* in that too narrow building which now importunately begs your compassionate bounty to enlarge its dimensions."

years; and it can hardly be doubted that the bulk of them in London also, with all its influx of country people, were at the same age-period. "Most born in London," said Lettsom, "have smallpox before they are seven." It is singular, therefore, that smallpox should have caused a much smaller proportion of the deaths from all causes in London than in the populous provincial cities. The annual average for London was one smallpox death to about ten or twelve other deaths; in other large towns it was one in about six or seven. Lettsom held that the proportion in London would have come out nearly the same if the classification of deaths in the London bills had been correct, the generic article "convulsions" having swallowed up, in his opinion, a large number of the smallpox deaths of infants. An assertion such as that is more easily made than refuted. Everyone agreed that there was no difficulty in recognising smallpox[1]. Whoever had seen confluent smallpox all over an infant's body was not likely to have set down its death under any other name, for there is hardly anything more distinctive or more loathsome. It is possible, however, that many infants with mild smallpox had died of complications, such as autumnal diarrhoea. Sydenham, indeed, says as much under the year 1667, blaming the nurses for killing the infants by trying to check the diarrhoea. The truly incredible sacrifice of infant life in London in the 17th and 18th centuries by summer diarrhoea, as shown in another chapter, may have caused a certain number of deaths of infants to be classed under "griping in the guts" in the earlier period, and under "convulsions" in the later, which were primarily cases of smallpox. But the true probability of the matter—and it is wholly for us a question of probability—is that London's smaller ratio of smallpox deaths and greater ratio of infantile deaths from other causes, was not artificially made by transferring deaths from the one to the other, but was actual, owing to a really greater liability of the London infants to die of other more or less nondescript maladies before smallpox could catch them[2].

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[1] The *Gent. Magaz.* Sept. 1752, p. 402, contains a long letter to refute the very prevailing notion among many people that there is very little occasion for doctors and apothecaries in smallpox, but that a good nurse is all the assistance that is usually wanted. "Whence this notion took its rise I cannot conceive, unless it was from the disease being visible, so that every one who has been at all used to it knows it when they see it."

[2] This was an argument used in the first writings on Inoculation, so as to prove the real hazard of dying by the natural smallpox. Thus, Maitland in his *Vindication*

The Epidemiology continued to the end of the 18th century.

The London bills, which are the only continuous series of figures, show the following annual mortalities by smallpox from 1761 to the end of the century:

Smallpox Mortality in London, 1761–1800.

Year	Smallpox deaths	All deaths	Year	Smallpox deaths	All deaths
1761	1,525	21,063	1781	3,500	20,709
1762	2,743	26,326	1782	636	17,918
1763	3,582	26,148	1783	1,550	19,029
1764	2,382	23,202	1784	1,759	17,828
1765	2,498	23,230	1785	1,999	18,919
1766	2,334	23,911	1786	1,210	20,454
1767	2,188	22,612	1787	2,418	19,349
1768	3,028	23,639	1788	1,101	19,697
1769	1,968	21,847	1789	2,077	20,749
1770	1,986	22,434	1790	1,617	18,038
1771	1,660	21,780	1791	1,747	18,760
1772	3,992	26,053	1792	1,568	20,213
1773	1,039	21,656	1793	2,382	21,749
1774	2,479	20,884	1794	1,913	19,241
1775	2,669	20,514	1795	1,040	21,179
1776	1,728	19,048	1796	3,548	19,288
1777	2,567	23,334	1797	522	17,014
1778	1,425	20,399	1798	2,237	18,155
1779	2,493	20,420	1799	1,111	18,134
1780	871	20,517	1800	2,409	23,068

The last twenty years of the century show a decrease in the annual averages of smallpox deaths, along with a decrease of deaths from all causes. The health of the capital had undoubtedly improved since the reign of George II., especially in the saving of infant life. But it is not worth while instituting a statistical comparison, for the reason that some large parishes, containing poor and unwholesome quarters, had become populous in the latter part of the century, but were not included in the

of 1722, which Arbuthnot is said to have had a hand in, deducts a quarter of the annual London deaths before he begins to estimate the ratio of smallpox among them, for the reason that eight out of nine infants who die in their first year are "non-entities" *quâ* smallpox, other causes of death having had the priority (p. 19). Jurin used the same argument for the same purpose in his *Letter to Caleb Cotesworth, M.D.*, 1723, p. 11: "It is notorious that great numbers, especially of young children, die of other diseases without ever having the smallpox"; and again, "very young children, or at most not above one or two years of age," including the stillborn, abortives and overlaid, chrisoms and infants, and those dead of convulsions. "It is true, indeed, that in all probability some small part of these must have gone through the smallpox, and therefore ought not to be deducted out of the account"; but he does deduct 386 in every 1000 London deaths before he estimates the ratio of smallpox deaths, which so comes out 2 in 17.

bills, while some of the old parishes, including those of the City, were probably become less populous owing to the conversion of dwelling-houses into business premises of various kinds. The decrease of fever-deaths in the bills is closely parallel with the decrease of smallpox, and it is probable that both were real; but as there is an element of uncertainty in the data it would be unprofitable to abstract statistical ratios from them, or to aim at demonstrating numerically what can only be in a measure probable. Perhaps the safest generality from these London figures is that smallpox once more fluctuates a good deal from year to year, seldom, indeed, falling below a thousand deaths, but showing a considerable drop for several years after some greater epidemic, as in the earlier history. This becomes most obvious by exhibiting the mortality in a graphic tracing.

Manchester, which was a healthier place than the capital, having an excess of births over deaths, had a smallpox mortality for six successive years, 1769–1774, as follows, the population, exclusive of Salford, having been 22,481 by a careful survey in 1773[1]:

Smallpox Deaths in Manchester.

Year	All deaths	Smallpox deaths
1769	549	74
1770	689	41
1771	678	182
1772	608	66
1773	648	139
1774	635	87
	3,807	589

Between a seventh and a sixth part of all the deaths in Manchester (15·3 per cent.) were from smallpox. All but one were under the age of ten years:

All deaths by smallpox	Under One year	One to Two	Two to Three	Three to Five	Five to Ten	Ten to Twenty
589	140	216	110	93	29	1

Manchester was one of the towns that had smallpox continuously from year to year at this period. It had a rapidly growing population, and an excess of births over deaths which was in great part due to the very large number of new families settling in it. It was probably this rapid increase of children that

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[1] Percival, *Med. Obs. and Inquiries*, v. 1776, p. 287; population in *Phil. Trans.* LXIV. 54.

explained the great height of the smallpox mortality in 1781, namely, 344, rising from three deaths in January and falling to thirteen in December, the maximum being in the third quarter of the year[1].

Liverpool, like Manchester, had smallpox among its infants and children steadily from year to year, and a higher rate of fatality from that cause than Manchester. With a population half as great again as that of Manchester, namely, 34,407 in 1773, it had the following deaths from smallpox, according to the figures taken from the registers by Dobson and supplied to Haygarth[2]:

Smallpox Deaths in Liverpool.

Year	Baptisms	Burials	Dead of smallpox
1772	1160	1085	219
1773	1192	1129	200
1774	1207	1420	243

The smallpox deaths were 1 in 5½ of all deaths. The figures also mean that nearly all the infants born in Liverpool, who survived the first months, must have gone through the smallpox.

Warrington, with a population (about 9000) one-fourth that of Liverpool, had a great periodic outbreak of smallpox in 1773, which caused about the same number of deaths that Liverpool had steadily in three successive years. The deaths were 207, with an incidence upon infants as remarkable as at Manchester. I reserve the figures for another section. Whether Warrington had much or any smallpox in the years between, it is known to have had fifty deaths in 1781, most of them in the first half of the year. Chester, in 1774, with a population half as great again as Warrington, namely, 14,713, had 1385 cases of smallpox, with 202 deaths, or 1 in 6·85, all the deaths being of children under five except 22, and those of children from five to ten. At the end of the epidemic a census showed that there were only 1060 persons in Chester who had not had smallpox. It was one of the healthier towns, which had a great smallpox mortality only in certain years; in 1772 it had 16 deaths, in 1773, only one death; the next great mortality after 1774 falling in 1777, when the deaths were 136, of which only 7 were in children above the age of seven years. In 1781 it had 7 deaths.

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[1] Haygarth, *Inquiry how to prevent the Smallpox*, 1784.

[2] Haygarth, *Sketch of a plan to exterminate the Natural Smallpox*. Lond. 1793, p. 139.

In the year 1781, when smallpox was so fatal to Manchester, Leeds also had an epidemic, 462 cases, with no fewer than 130 deaths, the population (in 1775) being 17,111, of whom only some seven hundred (or eleven hundred) at the end of the epidemic had not been through the natural smallpox.

At Carlisle, where the conditions of a greatly increased population (4158 in 1763 increased to 6299 in 1780) and weaving industries were the same as at Leeds, the smallpox deaths in a series of years were as follows[1]:

Deaths by Smallpox at Carlisle, 1779–87.

	Total	Under Five years	Over Five years
1779	90	136	7
1780	4		
1781	19		
1782	30		
1783	19	17	2
1784	10	9	1
1785	38	39	0
1786	—	—	—
1787	30	28	2
	241	229	12

The smallpox deaths were 13·37 per cent. of the deaths from all causes. The deaths from all causes under five years were 44·13 per cent.

Whitehaven, which had, like Liverpool, a large part of its labouring population housed in cellars, suffered severely from smallpox in 1783: "incredible numbers," says Heysham, of Carlisle, were attacked, of whom "scarcely one in three survived." The annual reports of its dispensary, which begin from that year, show a small number of calls to smallpox cases in most years; but it must have happened there, as Clark found it in Newcastle, that medical aid was not often sought for the children of the poor in smallpox unless they were dying. Smallpox was perhaps not peculiar among infantile troubles in that respect; but it is remarkable that it should have fallen so little under the notice of practitioners considering how important its aggregate effects were on the death-rate. In 1753 the readers of the *Gentleman's Magazine* took some interest in the question whether smallpox required the aid of a physician or an apothecary, or whether a nurse were not sufficient: instances were adduced in support of the latter view, while the serious claims of smallpox to regular medical attendance were elabo-

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[1] John Heysham, M.D. "An Abridgement of Observations on the Bills of Mortality in Carlisle, 1779–1787," in Hutchinson's *History of Cumberland.* 2 vols. Carlisle, 1794, and separate reprint, Carlisle, 1797; also reprinted in Appendix to Joshua Milne's *Treatise on the Valuation of Annuities.* London, 1815, pp. 733–752.

rately urged in a letter several columns long. At Newcastle, at all events, the prevalence and fatality of smallpox were actually unknown to Dr Clark, for all his zeal and statistical accuracy. Assuming from the experience of some other populous industrial towns, that it made a sixth part of the deaths from all causes, he estimated its annual mortality at 130.

Smallpox in Glasgow towards the end of the 18th century appears to have been more mortal to children than anywhere else in Britain. The figures are not known previous to 1783, from which year the laborious researches of Dr Robert Watt in the burial registers begin; but it is probable that the conditions were as favourable to smallpox at an earlier period[1]. In the year 1755 its mortality is given thus: "buried, men 273, women 206, children 584, total 963[2]."

The following table shows the Glasgow deaths from smallpox, and from all causes at all ages and at three age-periods under ten:

Glasgow Mortality by Smallpox and all causes, 1783–1800.

Year	All deaths	Smallpox deaths	All deaths under Two	All deaths 2—5	All deaths 5—10
1783	1413	155	479	174	66
1784	1623	425	671	161	45
1785	1552	218	576	126	42
1786	1622	348	706	179	56
1787	1802	410	746	205	65
1788	1982	399	770	221	68
1789	1753	366	794	188	76
1790	1866	336	903	247	86
1791	2146	607	984	320	63
1792	1848	202	664	184	54
1793	2045	389	807	239	80
1794	1445	235	553	144	62
1795	1901	402	761	225	62
1796	1369	177	562	181	54
1797	1662	354	586	241	57
1798	1603	309	642	181	41
1799	1906	370	783	244	78
1800	1550	257	545	148	53

Dividing the period into three of six years each, and abstracting the ratios, Watt got the following result[3], by which it appears

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[1] See Loveday's *Diary of a Tour,* 1732, p. 120.

[2] *Gent. Magaz.* 1755, p. 595. In a parish near Glasgow, Eaglesham, eighty children are said to have died of smallpox in 1713. Chambers, *Domest. Annals,* III. 387.

[3] Robert Watt, M.D., *Treatise on the History, Nature and Treatment of Chincough...to which is subjoined an Inquiry into the relative mortality of the Principal Diseases of Children, and the Numbers who have died under ten years of age in Glasgow during the last thirty years.* Glasgow, 1813.

that smallpox made between a fifth and a sixth of the whole mortality, and presumably a full third of all the deaths under five years:

Six-years period	All deaths	Ratio of fevers	Ratio of smallpox	Ratio under five years, all deaths
1783 to 1788	9994	12·65	19·55	50·06
1789 to 1794	11103	8·43	18·22	53·28
1795 to 1800	9991	[illegible]·24	18·70	51·03

The Glasgow figures bear out the rule that the greater the mortality of children from all causes, the greater the mortality from smallpox. The ratio of infantile deaths (under two) was actually higher in Glasgow in the end of the 18th century than in London during the very worst period of its history, the time of excessive drunkenness in the second quarter of the 18th century: the London deaths under two years were 38·6, and from two to five 11·37 per cent. of the annual average deaths from 1728 to 1737, while the Glasgow maxima were 42·38 and 11·90.

The examples last given are all of crowded industrial towns, the sanitary condition of which has been referred to in the chapter on Typhus. The market towns and the villages doubtless had the same relatively favourable experiences of smallpox which have been shown for them in the first half of the 18th century. It happens that the figures for Boston, Lincolnshire, of which a twenty-years series has been given already, are complete to the end of the century.

Smallpox Deaths in Boston, Lincolnshire, 1769-1800.

Year	Births	All deaths	Smallpox deaths	Year	Births	All deaths	Smallpox deaths
1769	159	120	3	1785	168	124	4
1770	140	166	78	1786	152	114	—
1771	150	133	2	1787	168	130	—
1772	138	130	6	1788	181	145	—
1773	157	143	27	1789	184	185	27
1774	160	112	—	1790	204	126	—
1775	162	186	55	1791	218	93	2
1776	165	176	7	1792	219	152	—
1777	165	131	6	1793	195	141	1
1778	166	174	18	1794	197	148	—
1779	173	195	3	1795	217	161	1
1780	137	247[1]	—	1796	214	205	64
1781	136	193	19	1797	240	166	—
1782	133	177	—	1798	227	112	—
1783	162	149	—	1799	229	133	—
1784	147	202	58	1800[2]	225	147	1

[1] This high mortality was probably caused by the epidemic agues of 1780, which specially affected Lincolnshire.

[2] In 1802 the smallpox epidemic recurred, with 33 deaths. In 1801 there was one death.

The second division of the table covers the same years as the Glasgow table, but tells a very different tale. It shows a great excess of births over deaths, and smallpox coming at the same long and regular intervals as in the twenty-years period before 1769, but now causing only a fifteenth part of the whole annual average deaths, or about one-third as many of them as in Glasgow. Whether the other market towns and villages of England had improved equally cannot be proved, owing to the almost total absence of smallpox statistics from the country south of the Trent. It was partly an accident that the best statistics of smallpox all came from the northern half of the country, where population and industries were growing most; but it was in part also because there was more epidemic disease there than elsewhere in England.

Some particulars or generalities were recorded for the parishes of Scotland in the last ten years of the 18th century by parish ministers writing for the *Statistical Account*:

Some of the Highland parishes suffered greatly from time to time by epidemics of contagious fever and by smallpox. Kiltearn, in Eastern Ross, a parish in which "the greatest number of cottages are built of earth, and are usually razed to the ground once in five or seven years, when they are added to the dunghill," was visited at intervals by infectious fever which spread from cottage to cottage, and by smallpox so disastrously in two successive years, 1777 and 1778, that above thirty children died in the first and no fewer than forty-seven in the second, owing, the minister thought, in part to improper management (*Statistical Account of Scotland*, I. 262). Something similar, although the numbers are not given, had happened in 1789 in the Western Ross parish of Applecross, which is now one vast deer-forest with two or three poor fishing hamlets. Of Kilmuir, in the extreme north-west of Skye, it is said, "In former times the smallpox prevailed to a very great extent, and sometimes almost depopulated the country."

In the parish of Holywood, Dumfriesshire, the yearly average marriages were 5, the baptisms 16, and the burials 11; but in 1782, the burials rose to 20, "owing to an infectious fever in the west part of the parish" (said elsewhere to be "chiefly owing to poor living and bad accommodation during the winter season"); and in 1786 "the large number of deaths"—namely fourteen all told—"was owing to the ravages of the natural smallpox" (I. 22).

In Galston parish, Ayrshire, "smallpox makes frequent ravages." In Eaglesham parish, near Glasgow, most of the infectious deaths are by fever, but smallpox also carries off great numbers (II. 118).

In the parish of Largs, Ayrshire, the number of deaths varied in different years "according as the smallpox or any species of dangerous fever prevailed"; in such cases the number of deaths were above forty, but in ordinary years between twenty and thirty, the mean annual average of births being about thirty. (II. 362.) But in Dunoon "we have commonly no sickness or fatal distemper except from old age and the complaints peculiar to children; and even these last are not in general fatal." (II. 390.) In Forbes and Kearn, Aberdeenshire, "some children are lost by the smallpox,

measles, and hooping-cough. But as the people in a great measure have got over their prejudices against inoculation, very few now die of the smallpox," (IX. 193).

In Monquhitter, in the same county: "the chincough, measles and smallpox return periodically; but the virulence of these disorders is now greatly lessened by judicious management" (VI. 122). In Grange, Banffshire, "of late neither the smallpox nor any inflammatory disorders have been very prevalent or mortal; the complaints are principally nervous" (IX. 563). In Fyvie, Aberdeenshire, "there has been no prevalent distemper for some time except the putrid sore-throat" (I. 461). But, in Dron, Perthshire, smallpox owing to the prejudice against inoculation, continues to carry off a great number of children; the hot regimen, and the keeping of the patients too long in their foul linen and clothes, are bad for the disease (IX. 468). In Fordyce, the ravages of the smallpox are very much abated by the practice of inoculation; the most prevalent distemper is fever (III. 48). In the seaboard parish of Rathen, smallpox occurred among the fishers (VI. 16). The fullest account is under the head of Thurso (XX. 502), supplied by John Williamson, surgeon: In December, 1796, the confluent smallpox became highly epidemic and fatal in the county of Caithness. In Thurso, more particularly, the epidemic was almost general, "and by my calculation one in four fell a victim." The mortality became so general that a general inoculation was proposed, and more or less carried out in most parishes except Latheron.

The most exact record is for the parish of Torthorwald Dumfriesshire; in two ten-year periods and one of seven years the mortality was as follows (II. 12):

	All deaths	Smallpox	Measles	Chin-cough	Fevers	Infants under one, cause unknown
1764—73	100	2	1	1	10	9
1774—83	100	5	0	3	7	14
1784—90	80	7	0	0	8	6

Ages at deaths from all diseases.

	All deaths	Under One	One to Two	Two to Five	Five to Ten	Ten to Forty	Forty to Seventy	Above Seventy
1764—73	100	9	2	1	2	19	28	39
1774—83	100	16	7	2	2	8	34	31
1784—90	80	8	2	1	4	12	23	30

Twelve of the fourteen smallpox deaths occurred after the introduction of inoculation in 1776, and were ascribed by the parish minister to that source. Again, in the parish of Whittinghame, among the Lammermuir hills, "it is not remembered that this parish has ever been visited with any epidemical distemper"—its vital statistics for ten years, 1781–90, being (II. 352):

Marriages	Baptisms	Burials
54	189	81

On the other hand another Berwickshire parish, Dunse, much more populous and occupied with weaving, had an epidemic of

smallpox in 1781, which brought the annual deaths up to 85, the births for the year being 54.

Authentic accounts of smallpox in Ireland in the 18th century are not easy to find, but it is clear from such notices of it as do exist that it could be widely prevalent and malignant in type. Rogers gives it a bad name in Cork in the first third of the century. During the great famine and fever of 1740–41 the deaths by smallpox are said to have been twice or thrice as many in Dublin as the deaths by fever[1]. The smallpox mortality, being chiefly of infants and children, attracted no special notice, just as the smallpox deaths in the famine of 1817–18, although more than those by fever, are all but unmentioned in the various accounts for those years. Rutty, of Dublin, under the year 1745, says: "The smallpox was brought to us by a conflux of beggars from the north, occasioned by the late scarcity there; whose children, full of the smallpox, were frequently exposed in our streets." His next mention of smallpox is in the winter of 1757–58, when the disease "kept pace in malignity," with the prevalent spotted or typhus fever. Amidst numerous entries of fevers of all kinds (typhus, agues, miliary fevers), as well as scarlatina and angina, these are the only two references to smallpox in Rutty's Dublin annals from 1726 to 1766. The annals kept by Sims of Tyrone overlap those of Rutty by a few years; and his first reference to smallpox is under the year 1766, which was a year of almost universal smallpox in England. Towards the close of 1766 and in the spring of 1767 the smallpox caused unheard-of havoc, scarcely one-half of all that were attacked escaping death. The disease had appeared the year before along the eastern coast, and proceeded slowly westward with so even a pace that a curious person might with ease have computed the rate of its progress. It had not visited the country for some years, and was not seen again until 1770, when it was less severe than in 1766–7[2].

Little is heard of smallpox in the army and navy in the 18th century. Pringle says, "We have never known it of any consequence in the field." On board ships of war it is mentioned occasionally, but very rarely in comparison with fever. Lind says that it prevailed in 1758 in the 'Royal George,' among a ship's company of 880 men: "it destroyed four or five persons

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[1] Barker and Cheyne, u. s.

[2] James Sims, M.D., *Observations on Epidemic Disorders.* London, 1773.

and left nearly a hundred unattacked[1]." Trotter has an occasional reference to it in his naval annals from 1794 to 1797[2]. One reason, and doubtless the chief reason, for its rarity in the services was that comparatively few escaped having it in childhood. The surgeon to the Cheshire Militia told Haygarth in 1781 that he found the whole regiment of six hundred to have had smallpox, except thirty[3]. It does not appear that so great a ratio of sailors or marines were protected by a previous attack; for Trotter counted 70 in a 74-gun ship of war who had not had it, and based a calculation thereon that there were about 6000 men in the navy in the like case. It was comparatively rare, also, in the gaols, doubtless for the same reason that has been suggested for the army and navy. Howard mentions it in only three of the prisons visited by him[4].

The range of severity in Smallpox, and its circumstances.

It has been abundantly shown in the foregoing, by the figures of Nettleton and others for Yorkshire and many other parts of England in 1722–27, of Frewen for Hastings in 1731, by the figures for each of the four parishes of Northampton in 1747, and by Haygarth's census of each of the nine (or ten) parishes of Chester in 1774, that the average fatality of smallpox was one death in six or seven attacks[5]. Any average of the

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[1] *Two papers on Fever and Infection*, 1763, p. 112.

[2] *Medicina Nautica.*

[3] Haygarth, *Sketch of a Plan, &c.*, 1793, p. 32.

[4] Gaol at Bury St Edmunds: In the winter of 1773, five died of the smallpox. No apothecary then. Leicester County Gaol: In 1774 three debtors and one felon died of the smallpox. "Of that disease, I was informed, few ever recover in this gaol." Oxford Castle: In 1773 eleven died of the smallpox. In 1774 that distemper still in the gaol. In 1775 one debtor died of it in May, three debtors and a petty offender in June; three recovered. No infirmary, no straw to lie on. *State of the Prisons.*

[5] I append Haygarth's full table of the Chester smallpox epidemic, 1774:

	Parish	Families	Persons	Recov'd. from smallpox	Died of smallpox	Not had smallpox
Suburbs	St Oswald	924	4027	321	40	350
	St John	774	3187	284	52	218
	St Mary	583	2392	240	45	205
	Trinity	330	1605	127	24	97
Old parishes	St Peter	193	920	52	6	39
	St Bridget	154	623	52	6	35
	St Martin	154	611	47	18	35
	St Michael	135	575	15	2	31
	St Olave	134	536	42	8	43
	Cathedral	47	237	3	1	7
		3428	14713	1183	202	1060

kind represents a very wide range, as indeed the table of epidemics on p. 518 sufficiently shows; and as it is a matter of scientific interest to ascertain, if possible for smallpox as for other epidemic infections, the circumstances of its greater or lesser fatality, I shall endeavour to illustrate still farther the fact of its wide range from an extremely mild to an extremely severe disease, and to inquire into the circumstances or conditions of the same.

In the first place, selected ages were below or above the average. Isaac Massey, apothecary to Christ's Hospital school, having boys to deal with at the most favourable of all ages for smallpox, found that not one had died of the 32 children "who are all that have had the smallpox, in the last two years, in that family"; and that "upon a strict review of thirty years business, and more, I have reason to think not 1 in 40 smallpox patients of the younger life have died, that is, above five and under eighteen[1]." On the other hand the London Smallpox Hospital, whose patients, as the stereotyped phrase in the reports said, were "most of them adults, often admitted after great irregularities and when there are hardly any hopes of a cure," had to acknowledge about one death in four or five cases on an average, which average, again, included such an unfavourable year as 1762, with 224 deaths in 844 cases.

Small groups of cases might perchance incline to mildness or to severity. Those of the former kind in the practice of one person were the more likely to be recorded. Thus Deering says that, in London about the year 1731, his method answered so well that "out of one hundred smallpox patients who were under my care within the course of two years, I lost but one. However, sincerity obliges me to own that the smallpocks were not during that whole time generally malignant, for some had them favourable, and the matter in others who had the confluent kind came in most by the eighth day to a good suppuration[2]." This might be matched with an experience from the seventeenth

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[1] Isaac Massey, *Remarks on Dr Jurin's last yearly Account of the Success of Inoculation.* Lond. 1727, p. 6. Huxham held that children might be "prepared" for the natural smallpox, as it was then the custom to prepare them for the inoculated disease, so that few of them need have it severely: "I am persuaded, if persons regularly prepared were to receive the variolous contagion in a natural way, far the greater part would have them in a mild manner." *On Fevers.* 2nd ed. 1750, p. 133.

[2] C. Deering, M.D., *Account of an improved Method of treating the Smallpocks.* Nottingham, 1737.

century already given on the doubtful authority of an empiric[1]. At Nottingham, in 1737, Deering claimed to have treated fifty-one cases with three deaths. Dr Robertson, physician to the fleet, says of his practice ashore: "When I arrived at Hythe in the beginning of April, 1783, the smallpox was pretty general...My patients, about fifty in number, all did well[2]."

The hold of a slave-ship may not seem a very good place to have smallpox in; and yet, in the voyage of the 'Hannibal,' 450 tons, 36 guns, from Guinea to Barbados in 1694, with 700 slaves on board, of whom 320 died on the passage from dysentery and white flux, the fatality of smallpox was so slight that "not above a dozen" were lost by it, "though we had a hundred sick of it at a time, and that it went through the ship[3]." This gives some colour to that remarkable experience in the treatment of smallpox which occupied so much of the attention of Bishop Berkeley and of his friend Prior about the years 1746–7. The captain of a slave-ship on his return home made affidavit before the mayor of Liverpool, "in the presence of several principal persons of that town," that smallpox attacked the slaves on board, when on the Guinea Coast, to the number of 170, that 169 of them who were induced to partake of tar-water recovered, and that the one negro who proved recalcitrant against the bishop of Cloyne's panacea died of the disease[4]. The somewhat low fatality of the Boston epidemic of 1752 (569 deaths in 5545 attacks not including the attacks among inoculated persons) was thought possibly due to the use of tar-water by many[5].

Sometimes a run of highly favourable cases was followed by a succession of fatalities, or *vice versa*. Dr Mapletoft, to whom

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[1] John Lamport alias Lampard, u. s.

[2] *Obs. on Ship Fever, &c.* New ed. Lond. 1789, p. 448.

[3] Thomas Phillips, "Journal of a Voyage," &c. in Churchill's *Collection of Voyages*, VI. 173.

[4] Berkeley's claim for tar-water in smallpox was a double one, as a preventive or modifier, and as a cure. Of the former he says: "Another reason which recommends tar-water, particularly to infants and children, is the great security it brings against the smallpox to those that drink it, who are observed, either never to take that distemper, or to have it in the gentlest manner." *Further Thoughts on Tar-water*, 1752. In his *Second Letter to Thomas Prior, Esq.* 1746 (in *Works.* 4 vols. Oxford, 1871, III. 476) he gives the famous case of curing by it:—"the wonderful fact attested by a solemn affidavit of Captain Drape at Liverpool, whereby it appears that of 170 negroes seized at once by the smallpox on the coast of Guinea one only died, who refused to drink tar-water; and the remaining 169 all recovered, by drinking it, without any other medicine, notwithstanding the heat of the climate and the incommodities of the vessel. A fact so well vouched must, with all unbiassed men, outweigh, &c."

[5] Prince, *Gent. Magaz.* Sept. 1753, p. 414.

Sydenham dedicated a book, was originally in good physician's practice and Gresham professor of physic; but he gave up these emoluments to enter the Church, and it is related by one who conversed with him in his extreme old age that he gave a singular reason for changing his profession, namely that, having treated smallpox cases for years without losing one (his treatment being to do nothing at all), he thereafter found that two or three died under his hands[1].

Fothergill's sixteen cases, in a certain locality of London in 1752, with only one death, are an instance of a run of mild cases. At the Whitehaven Dispensary in 1796 there was a good instance of how an average is made up; of the first seven cases attended from the dispensary three died, and then followed a run of thirty-four cases with only two of them fatal. Again, a high or low degree of fatality might seem to pertain to a particular spot. Bateman gives an instance in 1807 of 28 deaths within a month in a single court off Shoe Lane; also in 1812, "in one small court in Shoe Lane, seventeen individuals have lately been cut off by this variolous plague[2]." One can understand that of the old Shoe Lane; but why should Nantwich have been reputed never to have its smallpox mortal? Worse things are told of country smallpox in Scotland than in England. In 1758, it is said, 8 died out of 28 near Cupar Fife, and in some parts of Teviotdale "three or four died for one that recovered[3]." Similar unparalleled mortalities are reported by some parish ministers in the 'Statistical Account.'

Cleghorn stationed with British troops in Minorca had a good opportunity of comparing two epidemics of smallpox, one in 1742 and the other in 1746. There had been no smallpox since 1725, so that when it did come in March, 1742, it found many susceptible of it: "every house was a hospital"; but "in proportion to the numbers, not many died; and what mortality there was happened chiefly among children at the breast and the common soldiers. About the end of July the disease suddenly disappeared, most of those who were susceptible of it having by that time undergone it." Four and a half years after, in December, 1745, the infection was brought in by one of H. M. ships from Constantinople, and produced in many cases attacks of

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[1] Walter Lynn, u. s. 1715, *ad init.*

[2] *Reports, &c.* 1819.

[3] Whytt, *Med. Obs. and Inquiries*, II. (1762), p. 187.

a bad type; which leads Cleghorn to remark that "it is a matter of chance whether the best or the worst kind is got in the natural way[1]." Barbados had its epidemic maladies noted from season to season for several years by Hillary, who enters smallpox once: "May, 1752, smallpox epidemic: in general of the distinct kind; and in those few who had the confluent sort, they were generally of a good kind[2]." Foreign observers were sometimes struck by the same mildness of a whole epidemic[3].

The often cited remark of Wagstaffe in 1722, that there were cases which a physician could not save and cases which a nurse could not lose, had many illustrations. The cases of Queen Mary, in 1694, with the best physicians at her bed-side, and of the Duke of Gloucester in 1660, show the one event; the following from the *Gentleman's Magazine*, shows the other:

> In the parish of Whittington, Derbyshire, seventeen patients in all had the smallpox in the year 1752; the first was seized June 7, and the last August 12. They were all children, of various ages, and all did well. An apothecary was called to one only of them[4].

A note added says:

> "William Cave, a tradesman of Rugby, had twelve children, who, with three nephews, were seized with the smallpox; some of them had it severely, but all did well through the care of their mothers, without the intervention of an apothecary."

Or there might be the average fatality in village epidemics left to domestic treatment only. At Kelsall and Ashton, two small Cheshire villages, sixty-nine persons had smallpox during seven months of 1773, of whom twelve died. "No medical practitioner visited any of the patients during the whole disease[5]."

To find a single principle of cleavage through the smallpox of the 18th century, dividing it into good and bad, is impossible. The determining things were manifold, and they are to us obscure. Things proper to the individual constitution or temperament, hidden in what has been called "the abysmal deeps of personality," cover a good deal in our reactions towards smallpox as in more important relationships. Generalizing such facts to the utmost, we do not get beyond the notion that the

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[1] Cleghorn, *Diseases of Minorca*. London (under the years).

[2] Hillary, *Changes of the Air, and Epidemical Diseases of Barbados*.

[3] Muret, *Mém. par la Société Économique de Berne*, 1766. "Population dans le pays de Vaud": p. 102, "J'ai vu à Veney, la petite vérole être générale dans toute la ville, des centaines d'enfans attaqués de cette maladie, et qu'à peine il en mouroit sept ou huit."

[4] *Gent. Magaz.* 1753, p. 114. Letter from Sam. Pegge, rector, 17 Feb. 1753.

[5] Haygarth, *Phil. Trans.* LXV. 87.

greater or lesser degree of proclivity runs in families. Morton could recall no case of smallpox fatal in his own family, nor, curiously enough, among his wife's relations. On the other hand he introduces a case, his 53rd, as if to illustrate the contrary—a fair and elegant young lady, sprung of a distinguished stock, but one to which this disease was wont to prove calamitous as if by hereditary right[1]. The royal family of Stuart had a peculiar fatality in smallpox; and so, it appears, had the family of the earl of Huntingdon, who wrote to Thomas Coke on 18 June, 1701: "I am informed Lord Kilmorey [married to his sister] is ill of a fever, and that some think it may prove the smallpox. For the love of God, send for my sister to your house. She never has had them and they have proved fatal in our family[2]." A similar fatality in the family of John Evelyn can be traced in the pages of his diary.

Next to the individual constitution, we may take the epidemic constitution, in the Hippocratic sense. No one keeping before him the strange diversities of type in whole epidemics of scarlatina and measles will say that the Hippocratic doctrine of varying constitutions is not requisite to cover a certain element of mystery. But we should rationalize it wherever we can; and there are some obvious considerations that may be used to explain why smallpox, throughout a whole epidemic, had so high an average fatality in some years or in some localities. Rutty, who noted the fevers and other prevalent maladies in Dublin and elsewhere in Ireland from year to year, and the associations of the same with famine or the like, says that some had dysentery in 1757, "promoted perhaps by the badness of their bread, as it was a time of great scarcity," that a low, putrid, petechial fever followed in the winter, fatal to not a few of the young and strong both in Dublin and in the country, and that as the cases of petechial fever increased much beyond the usual number in January, 1758, "it was observable that the smallpox kept pace in

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[1] Morton, *Pyretologia*, II. 338: "Et quidem omnes haereditario quasi jure benignis istis variolis tentabantur, quae (Deo favente) eventum secundum habuerunt; nunquam enim quemquam meà vel conjugis meae stirpe ortum hoc morbo periisse memini." The case of hereditary tendency to fatal smallpox is No. 53, p. 470: "Domina Theodosia Tytherleigh, virgo elegans ac formosa, stirpe celeberrima (sed cui hic morbus jure quasi haereditario funestus esse solebat)" &c. She died in a late stage of the disease.

[2] *Cal. Coke MSS.* (Hist. MSS. Commis.) II. 429.

malignity with the fevers[1]." That was the same year, 1758, for which Whytt records, along with the fatal smallpox of Fifeshire and Teviotdale, a dysentery and pestilential fever a month or two before, disastrous in Argyllshire, less mortal in Haddington and Newcastle, as well as an influenza all over Scotland[2]. Again, in the country town and parish of Painswick, Gloucestershire, there was an epidemic of smallpox in the summer of 1785 so fatal that nearly one in three of the infected died. "This fatality," says J. C. Jenner, "may in some measure perhaps be attributed to a contagious fever and epidemic ague which prevailed at the same time, and to the heat of the atmosphere"—many being dropsical from the agues that had afflicted them for months, and many reduced by the typhus fever[3]. A striking instance of the fatality of smallpox among children in a poor state of health owing to previous disease is given by Sir William Watson:

At the Foundling Hospital of London, containing upwards of 300 children, there were 60 cases of smallpox during the last six months of the year 1762, of which only 4 died, or 1 in 15. In April and May of next year (1763) measles of a bad type broke out among the 312 inmates, attacking 180, of whom 19 died (over 1 in 10), while many who recovered were greatly weakened, having ulcerations of the lips and mouth for some time after. In May and June, when the children were recovering from measles, the smallpox attacked many in the hospital, including 18 who had lately gone through the measles. No fewer than 11 of those 18 died of smallpox. A corresponding fatality of smallpox was observed shortly before among children at the Foundling who were recovering from or had lately passed through the dysentery or "dysenteric fever[4]."

It happens that we can compare a mild or average smallpox with an unusually fatal one, and the conditions on which they respectively depended, in the two neighbouring towns of

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[1] Rutty, *Chronological History of the Weather and Seasons, and prevailing Diseases in Dublin during forty years.* London, 1770, under the dates.

[2] Short (*Comparative History of the Increase and Decrease of Mankind in England, &c.* Lond. 1767) has found somewhere a statement that in 1717 there was "a most fatal continual fever in the West of Scotland, in January and February, and not less fatal confluent smallpox in March and April."

[3] *Lond. Med. Journ.* VII. 163.

[4] W. Watson, in *Medical Observations and Inquiries by a Society of Physicians in London*, IV. (1771), p. 153. Whether the epidemic that preceded the smallpox was measles or scarlatina is a question that was raised by Willan, and is referred to in the chapter on "Scarlatina and Diphtheria."

Warrington and Chester in the two successive years 1773 and 1774. Chester in 1774 had the average kind of epidemic—1385 cases with 202 deaths (1 in 6·85), all in children. The Chester populace, as described by Haygarth, lived for the most part in poor houses of the newer suburbs; they were filthy in their persons and their houses were often visited by typhus fever (supra, p. 41). But the occupations of the men were not unhealthy, and the women would seem to have been left to their domestic duties in the usual way. At Warrington the circumstances were different. A seat of the sailcloth weaving from the Elizabethan period (as early as 1586 the "poledavies" of Warrington are mentioned), it had retained its repute and extended its industry as sailcloth came more into demand[1]. The American War, and the earlier war with the French in Canada, caused an immense number of ships to be commissioned for the royal navy, and the Warrington looms are said to have furnished half of all the sailcloth that the fleets needed[2]. Its manufacturers made their fortunes, new looms were added, population was drawn to the town from the country, marriages multiplied and were unusually prolific, and the swarms of children were hardly into their teens before they were set to earn wages along with their fathers and their mothers. We have vital statistics from the parish register by Aikin[3], and an account of the industries by Arthur Young, as he saw them in 1769[4]. During the twenty years from 1702 to 1722, each marriage, according to the register, produced only 2·9 children; from 1752 to 1772, the marriages averaged 73 in a year, and the baptisms 237, being 3·25 children to each marriage[5]. But in the last three years of that period, 1770–72, the marriages had risen rapidly to an annual average of 95, and the baptisms to 331, being about 3·5 children to each marriage. From 1773 to 1781 the marriages averaged 85 and the fecundity reached 4·5 children to each. Arthur Young found the whole of this

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[1] *Annals of the Lords of Warrington and Bewsey from* 1587. By W. Beamont. Manchester, 1873, p. xix.

[2] John Aikin, M.D., *Descriptions of the Country from thirty to forty Miles around Manchester.* London, 1795, p. 302.

[3] Taken out of the register by Aikin at the request of Dr Richard Price, and published by the latter in the 4th ed. of his *Obs. on Reversionary Payments.* Lond. 1783, II. 5, 100.

[4] Arthur Young, *Six Months Tour through the North of England.* 4 vols. London, 1770–71, III. 163.

[5] Percival, *Phil. Trans.* LXV. 328.

community, men, women, and children, engaged in sailcloth or sacking manufacture, boot-making, and pin-making.

> "At Warrington the manufactures of sailcloth and sacking are very considerable. The first is spun by women and girls, who earn about 2*d.* a day. It is then bleached, which is done by men, who earn 10*s.* a week; after bleaching, it is wound by women, whose earnings are 2*s.* 6*d.* a week; next it is warped by men, who earn 7*s.* a week; and then starched, the earnings 10*s.* 6*d.* a week. The last operation is the weaving in which the men earn 9*s.*, the women 5*s.*, the boys 3*s.* 6*d.* a week. The spinners (women) in the sacking branch earn 6*s.* a week. Then it is wound on bobbins by women and children, whose earnings are 4*d.* a day....The sailcloth employs about 300 weavers, and the sacking 150; and they reckon 20 spinners and 2 or 3 other hands to every weaver."

On that basis of reckoning, Young estimated that the Warrington manufactures employed about eleven thousand hands; but as Aikin, in 1781, counted the whole inhabitants of the borough and three adjoining hamlets at 9501, it is clear that a good many spinners of the flax and hemp who lived in the country near Warrington must be allowed for in the eleven thousand. At all events Warrington was an early and an extreme instance of that hurry and scramble of wage-earning, by fathers, mothers and children, which the growth of manufactures in the latter part of the 18th century gave rise to, and of which many particulars came to light long after during the discussions that preceded the passing of the Factory Act. The mothers were workers, and all the while breeders at a somewhat high rate. It is difficult to imagine how the household duties were got through, and the infants reared, in such an industrial hive. Nor was there much attention given, during those great days of the sailcloth industry, to the scavenging and lighting of the town, and probably little to the overcrowded state of its old-fashioned streets and lanes. It was in January and February, 1775, fully a year after the great smallpox epidemic had ceased, that Mr Blackburne, who had become lord of the manor in 1764, "promoted the design of establishing a court of requests at Warrington, cleansing and lighting the town, and removing the butchers' stalls." These proposals, we are told, gave rise to a paper war[1].

Ferriar has described what was apt to happen when country people migrated to manufacturing towns, got married, and had children born to them:

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[1] Beamont, u. s. p. 116–17.

> "A young couple live very happily, till the woman is confined by her first lying-in. The cessation of her employment then produces a deficiency in their income, at a time when expenses unavoidably increase. She therefore wants many comforts, and even the indulgences necessary to her situation: she becomes sickly, droops, and at last is laid up by a fever or a pneumonic complaint; the child dwindles, and frequently dies; the husband, unable to hire a nurse, gives up most of his time to attendance on his wife and child; his wages are reduced to a trifle; vexation and want render him diseased, and the whole family sometimes perishes, from the want of a small timely supply which their future industry would have amply repaid to the public[1]."

What Ferriar saw so often some years after at Manchester must have been a not uncommon case at Warrington during the bustling time that Arthur Young describes. Its infantile mortality was certainly excessive, according to the following comparison with that of Chester, from the figures supplied to Price by Aikin from the Warrington burial registers of nine years, 1773–81, and by Haygarth from the Chester bills for ten years, 1772–81[2]. The deaths are reduced to annual averages, and those of Warrington are raised, in the third column, to the ratio of the population of Chester by making them half as much again.

Annual average of deaths from all causes under five years.

Ages at death	Warrington. Pop. 9,501 in 1781	Chester. Pop. 14,173 in 1774	Warrington raised to the ratio of Chester
Under one year	72·7	80·6	109·0
One to two	43·5	36·1	65·2
Two to three	20·1	23·4	30·1
Three to four	11·5	14·4	17·2
Four to five	7·0	8·7	10·5

It was among infants and young children born and brought up with such comparatively poor chances of surviving, that smallpox broke out at Warrington in January, 1773, reaching its climax in May and ending about October, with a mortality of 209 or 211. Aikin says:

> "Its victims were chiefly young children, whom it attacked with such instant fury that the best-directed means for relief were of little avail. In general the sick were kept sufficiently cool, and were properly supplied with diluting and acidulous drinks; yet where they recovered, it seemed rather owing to a less degree of malignity in the disease or greater strength to struggle with it, than any peculiar management. When it ended fatally, it was usually before the pustules came to maturation; and, indeed, in many they showed no disposition to advance after the complete eruption, but remained quite flat and pale"—a sure sign of poor *stamina vitae*. "In one neighbourhood I found that out of 29 who had the disease, 12 died, or about 2 in 5; in others the mortality was still greater, and I have reason to believe it was not less on the whole."

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[1] Ferriar, *Med. Obs. and Reflections*.

[2] Price, *Reversionary Payments*. 4th ed. II.

The monthly progress of the mortality at Warrington and Chester respectively was as follows[1]:

	Deaths. Warrington, 1773	Deaths. Chester, 1774		Deaths. Warrington, 1773	Deaths. Chester, 1774
Jan.	4	0	July	33	11
Feb.	4	1	Aug.	11	26
March	13	0	Sept.	7	28
April	23	0	Oct.	3	46
May	63	3	Nov.		44
June	49	3	Dec.	1	40[2]
				211	202

The following are the ages at which the children died of smallpox, and of all causes, in each town during the epidemic year[3]:

	Warrington (pop. in 1781, 9501)		Chester (pop. in 1774, 14,713)	
Ages	Smallpox	Other deaths	Smallpox	Other deaths
Under one month	0	18	0	17
One to three months	4	9	3	19
Three to six months	4	9	4	10
Six to twelve months	39	15	44	8
One to two years	84	24	38	14
Two to three years	33	5	42	3
Three to five years	33	14	49	13
Five to ten years	12	15	22	8
Above ten years	0	—	0	—
	209	—	202	—

Comparing the ages at death in the two epidemics, we see at a glance that the second year was most fatal to children at Warrington, whereas at Chester the deaths fell more at the higher ages, although in ratio of its population it was only on a par with Warrington even at these ages.

If the great smallpox year at each town be left out, 1773 at Warrington, 1774 at Chester, the mortality of infants in their second year from all causes is found to be one-third more at Warrington than at Chester on an annual average of eight (or nine) years. Some such difference Haygarth says was well

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[1] Aikin, *Phil. Trans.* LXIV. (1774), p. 438; Haygarth, *ibid.* LXVIII. 131.

[2] "Almost ended at the winter solstice, only 19 remaining ill in January, 1775."

[3] Percival, for Warrington, *Med. Obs. and Inquiries*, V. (1776), p. 272 (information from Arkin); Haygarth, for Chester, *Phil. Trans.* LXVIII. 150. Haygarth (*Sketch of a Plan, &c.* p. 141) gives the following table of the smallpox deaths and the deaths from all causes at several ages of children up to ten years at Chester from 1772 to 1777 inclusive:

	Under one	1—2	2—3	3—5	5—10	Total
Smallpox deaths	91	75	83	86	34	369
All other deaths	392	155	68	68	53	736

known between the smallpox of great and small towns, namely, that it "attacks children at an earlier age, and consequently is fatal to a larger proportion of people, in great than in small towns[1]." Although Warrington was the smaller town, infants died earlier there than at Chester (from smallpox and from all causes), or the probability of life was less ;—a statistical fact which Price made out, but was unable to explain. The explanation is the poor stamina of the Warrington children, which was due most of all to the circumstance that the married women were at once wage-earners and prolific breeders.

In the smallpox year at Warrington, the deaths from all causes under five years of age were 62·5 of the whole mortality, (in infants under two years they were 43·5 per cent. of all deaths) smallpox having caused them in the ratio of 199 to 291. Although Aikin's estimate of two deaths in five cases is improbable for the whole epidemic, we may admit a rate of one death in four, which would give Warrington in 1773 about as many cases in proportion to its numbers as Chester had in 1774—844 in a population of some 9000, as compared with 1385 in a population of 14,713.

The epidemics of smallpox at Carlisle in 1779 and Leeds in 1781 were unusually mortal, for reasons analogous to those assigned in the case of Warrington. Both towns had increased fast in numbers, owing to the growth of the weaving and spinning industries, both were overcrowded, ill ventilated, and filthy, and both had high mortalities from typhus fever among the adults, as described in another chapter. At Carlisle, the great epidemic of smallpox, which was the children's special scourge, came in 1779, two years before the typhus fever reached a height. The smallpox caused 90 deaths, while "a species of scarlet fever" at the same time caused 39 deaths. Heysham estimated somewhat vaguely that these 90 deaths occurred in 300 cases, or one case fatal in 3·3, which is double the average[2]. Lucas gives the proportion at Leeds more exactly—462 cases, in six months, with 130 fatalities, or 1 in 3·5. The epidemic at Leeds in 1721–22, which Nettleton described as "more than usually mortal," caused 189 deaths in 792 attacks, or 1 in 4·2. There were fewer attacks in the much larger population (17,117) of

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[1] *Sketch of a plan, &c.* p. 31.

[2] Heysham, *Obs. on Bills of Mortality in Carlisle*, 1779–1787. Carlisle, 1797. Reprinted from App. Vol. II. of Hutchinson's *Cumberland*.

1781, perhaps because there were fewer persons who had not had the disease already, and these almost exclusively the infants born and the young children who had grown up since the last epidemic[1]. In those circumstances it is hardly surprising that the Leeds smallpox of 1781 should have been a degree more mortal than that of 1721–22, which was itself "more than usually mortal."

A complete survey of smallpox in its great period, the eighteenth century, in all places and continuously from year to year, is impossible even if it were to be desired. Had it not been for the exact diligence of a few, especially in the North of England, we should have been left in doubt on some of the main epidemiological generalities. A system of registration such as was applied for the first time in the epidemic of 1837–39 would have saved much research and would have made it possible to bring the facts within a smaller compass. By comparison and classification of many scattered particulars we may still acquire a tolerably clear notion of what smallpox was in the 18th century. It was chiefly a disease of infancy and early childhood. It was always present in one part or another of the capital and of the larger towns, rising at intervals to the height of a great and general epidemic[2]. At its worst, as in Glasgow, it took about a third part of the lives under the age of five, and perhaps a sixth part of the lives at all ages. It came in epidemics at somewhat regular intervals in the smaller towns, and at longer intervals in the country parishes. The village epidemics were apt to be very searching when they did come. Haygarth gives the instance of Christleton, a small village two miles from Chester, in 1778: "The distemper began in March and continued till October. At the commencement of the epidemic, 107 poor children had never been exposed to the variolous infection; of these 100 had the distemper, probably all who were capable of receiving the smallpox." In all places, with the possible exception of London where the risks from

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[1] Lucas, *Lond. Med. Journ.* x. 260: "The number of those who were still uninfected was found on a survey to be 700."

[2] Dr Henry, of Manchester, to Haygarth, 20 March, 1789, in the latter's *Sketch of a Plan, &c.* p. 369: "In large and populous places such as Manchester, the smallpox almost always exists in some parts of the town. I have known it strongly epidemic in one part without any appearance of it in others... At present it is prevalent and fatal in the outskirts, but very rarely occurs in the interior parts of the town."

infantile diarrhoea and "convulsions" were peculiar, it cut off the infants and young children more than any other single disease, infectious or other; and indeed it had few rivals among infectious diseases until towards the close of the century, being for a time the grand epidemic scourge of the first years of life just as the plague was once the unique scourge of youth and mature age. It was more mortal in some seasons than in others, and at certain places. Towards the end of the 18th century, much more is heard of it in the northern industrial towns than in England south of the Trent. If the statistics of Boston, Lincolnshire, are at all representative, smallpox certainly declined much in market towns in the last twenty years of the century. It appears to have declined also in the capital during the same period. In the parishes of Scotland, by the almost unanimous testimony of the articles which refer to it in the 'Statistical Account,' it had become much less frequent and less dangerous for some years previous to the publication of that work (1792–98). In Glasgow, with the worst statistics of children's deaths in the whole kingdom, the maximum had been reached, and passed, in the period between the close of the American war and the first years of the great war with France. As the French war proceeded, and vast sums of public money were poured out (the bill being left to Prince Posterity to pay), the effects of this abundance were seen in the remarkable decline, and almost total disappearance, of fevers all over England, Scotland and Ireland. Corresponding with the lull in fevers there was a lull in smallpox, not so marked as the former, but very significantly covering the same period and lasting until the great depression of trade in 1816 which followed the Peace. This will appear in continuing the chronology of epidemics; but before we come to that, it remains to make clear the scientific or pathological nature of a new kind of inoculation which became at this juncture the rival of the old. The extent to which each of the rival methods was practised will become a subject of inquiry after the epidemic of 1817–19 has been dealt with.

Cowpox.

Much has been said, in previous sections of this chapter, as to the efforts of inoculators to reduce the effects of inoculated virus "to as low a degree as we could wish." What kind of

matter do you use? one inoculator would ask of another. The comparative trials of Watson had shown that serous or watery matter from an unripe pustule of smallpox, preferably from the unripe pustule of a previous inoculation on the arm, was most "successful," the success being measured by the slightness of the effect produced at the time. The comparative trials of Mudge had confirmed that, but had gone a little farther in showing that these slight effects of crude or unripe matter left the constitution still open to the same effects by the same means, or to more severe effects by more severe means. What kind of matter to use was, accordingly, still an open question, which offered some scope for originality and ingenuity. Among other sources of crude or watery matter with bland properties was the glassy or watery variety of eruption called swinepox, which, like its congener chickenpox, was peculiar to man; and among those who tried that source of non-purulent matter for inoculation was Jenner, of Berkeley. It was in 1789 that he inoculated his child, aged eighteen months, with matter from the so-called swinepox of man. There was still another pox bearing the name of a brute animal, which was, however, a true affection of brutes—the cowpox or pap-pox. A farmer at Yetminster, Dorset, named Benjamin Jesty, had used matter from that source for the inoculation of his wife and two young children in 1774, with the result that the arm of the former was much inflamed and had to be treated by a surgeon. There seemed to be no good reason for preferring matter of such dangerous tendency, and the experiment was not repeated. A few years after, an apothecary of Lyme, in Dorset, is said to have heard of another case of the domestic use of cowpox matter for inoculation by the mistress of a farm house, and to have pressed this fact upon the attention of Sir George Baker; who, although a supporter of the mild or Suttonian inoculations with crude lymph, and by his own avowal a friend of experiments, did not favour the trial of matter from the pap-pox of cows, probably for the reason that he should have been departing from the ground-principle of inoculating for the smallpox if he were to go outside the class of variolous disease for his matter. The true virtuoso, however, has no antecedent objection to experimenting with anything. Sometime after Jenner had used the swinepox matter, he began to talk among his medical neighbours of using cowpox matter. But it was known that cowpox matter had

properties and effects of its own, and that it would be a radical innovation to use it, a departure *toto coelo* from every modification hitherto tried in the inoculation procedure. Although it was also a pox by name, and although cowpox to the apprehension of a man of words or notions might seem to be in the same class as swinepox, glasspox, hornpox, waterpox or chickenpox, yet those who had ever seen it on the chapped hands of milkers would hardly admit that matter from such a source could serve for inoculation purposes unless upon wholly independent and original proof of efficacy. Jenner's colleagues are reported to have denied that cowpoxed milkers escaped natural smallpox any more than their fellows[1]. About the year 1794 Jenner began to press the subject upon the attention of his friends. His clerical neighbour, Worthington, mentioned it in one of his letters to Haygarth, of Chester, who replied, on 15 April, 1794:

> "Your account of the cowpox is indeed very marvellous, being so strange a history, and so contradictory to all past observations on this subject, very clear and full evidence will be required to render it credible. You say that this whole rare phenomenon is soon to be published, but do not mention whether by yourself or some other medical friend. In either case I trust that no reliance will be placed upon vulgar stories. The author should admit nothing but what he has proved by his own personal observation, both in the brute and human species. It would be useless to specify the doubts that must be satisfied upon this subject before rational belief can be obtained. If a physician should adopt such a doctrine, and much more if he should publish it upon inadequate evidence, his character would materially suffer in the public opinion of his knowledge and discernment[2]."

It is clear that Haygarth, who was well acquainted with epidemic smallpox and with inoculation, saw in this Gloucestershire idea something quite new as well as antecedently improbable. What the real novelty was will appear from the next historical reference to cowpox in an original work upon Morbid Poisons by Joseph Adams, a writer of the Hunterian school. All that Adams knew of the nature of cowpox previous to March, 1795, came from Cline, surgeon to St Thomas's Hospital, who had been a fellow student of Jenner's five and twenty years before, and kept up some correspondence with him. Adams is writing on the peculiar danger of ulceration and sloughing, or phagedaena, from transferring animal matters from one body to another, his last illustration having been the notorious

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[1] "Most of them [Jenner's colleagues] had met with cases in which those who were supposed to have had cowpox had subsequently been affected with smallpox." Baron, *Life of Jenner*, I. 48.

[2] Haygarth to Worthington, 15 April, 1794, in Bacon's *Life of Jenner*, I. 134.

phagedaenic ulceration of the gums, with rashes of the skin and constitutional effects so severe as to be fatal, which followed the transplantation of fresh teeth from one person to another in a number of cases about the year 1790 and led to the speedy abandonment of that unnatural practice[1]. He proceeds to say, "Thus far we have only traced the poisonous effects of matter applied from one animal to another of the same class," and then he brings in the illustration of cowpox to finish the chapter:

> "The cowpox is a disease well known to the dairy-farmers in Gloucestershire. The only appearance on the animal is a phagedaenic ulcer on the teat, with apparent inflammation. When communicated to the human subject, it produces, besides ulceration on the hand, a considerable tumour of the arm, with symptomatic fever, both which gradually subside. What is still more extraordinary, as far as facts have been hitherto ascertained, the person who has been infected is rendered insensible to the variolous poison[2]."

Jenner's own essay on the cowpox, when it appeared at length in 1798, confirmed these statements as to the phagedaenic or corroding ulcerous character of the milkers' sores, in his brief accounts of several cases, of which it will suffice to mention these two: William Stinchcomb, farm servant, had his left hand severely affected with several corroding ulcers, and a tumour of considerable size appeared in the axilla of that side; his right hand had only one small sore. A poor girl, unnamed, "produced an ulceration on her lip by frequently holding her finger to her mouth to cool the raging of a cowpox sore by blowing upon it[3]." Inquiries made by Dr George Pearson in various other dairy counties of England brought out the same character of cowpox in milkers: the painful sores might be as large as a sixpenny piece, and might last a month or two, causing the milker to give up his work[4].

As to the pap-pox itself, or cowpox in the cow, the most circumstantial account was obtained, a few months after Jenner's first essay, by interrogating a veterinary surgeon or cow-doctor, one Clayton, who attended at most of the farms within ten miles of Gloucester:

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[1] See the cases and remarks by John Hunter, Sir W. Watson, Lettsom and others.

[2] Joseph Adams, *Observations on Morbid Poisons, Phagedaena and Cancer.* 1st ed. Lond. 1795. Preface, 31 March.

[3] I have collected all the scattered references in Jenner's writings to cowpox in the cow or in infected milkers in my *Natural History of Cowpox and Vaccinal Syphilis.* London, 1887, pp. 53-57.

[4] G. Pearson, *Inquiry concerning the History of Cowpox.* Lond. 1798.

"That the chief diseases of the cow are the lough, swellings of the udder, and cowpox; that the two former are the most common, the latter being rarely seen except in spring and summer.

That cowpox begins with white specks upon the cow's teats, which, in process of time, ulcerate: and, if not stopped, extend over the whole surface of the teats, giving the cow excruciating pain.

That, if this disease is suffered to continue for some time, it degenerates into ulcers, exuding a malignant and highly corrosive matter; but this generally arises from neglect in the incipient stage of the disease, or from some other cause he cannot explain.

That this disease may arise from any cause irritating or excoriating the teats; but that the teats are often chapped without the cowpox succeeding. In chaps of the teats, they generally swell; but in the cowpox, the teats seldom swell at all, but are gradually destroyed by ulceration.

That this disease first breaks out upon one cow, and is communicated by the milker to the whole herd; but if one person was confined to strip the cow having this disease, it would go no farther.

That the cowpox is a local disease, and is invariably cured by local remedies.

That he never knew this disease extend itself in the highest degree to the udder, unless mortification had ensued; and that he can at all times cure the cowpox in eight or nine days[1]."

No account of cowpox in the cow has ever been given which differs materially from that of this experienced Gloucester cow-doctor in 1798[2]. Cowpox is not only a local disease, but it is peculiar to certain individuals of the species, namely cows in milk; in them it occurs on the teats, so that it was correctly known in Norfolk by the name of pap-pox. The common observation has been that one cow starts it, and that an infection is rubbed into the teats of others by the fingers of the milkers. The cow which develops this ulceration of the paps is usually either a heifer in her first milk, from which the calf has been taken away, or a cow in milk which has been bought in a market, with the udder "overstocked" or left distended for appearance sake, but as yet with no blemish of the paps. The cause of cowpox is the rough handling of a highly sensitive part, which was originally adapted only for the lips and tongue of the calf. Ceely, a correct observer in the Vale of Aylesbury, uses no exaggerated phrase when he speaks of "the merciless

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[1] Beddoes' *Contributions to Physical and Medical Knowledge.* Bristol, 1799, p. 387.

[2] See my *Natural History of Cowpox, &c.* u.s. 1887. The most systematic descriptions, both for cows and milkers, are by Ceely, in *Trans. Provinc. Med. and Surg. Assocn.* VIII. (1840) and X. (1842). Professor E. M. Crookshank has reproduced these valuable memoirs, with the coloured plates, in his *History and Pathology of Vaccination.* 2 vols. London, 1889. The plates are in vol. I., the memoirs in vol. II. Crookshank's volumes, which are a convenient repertory of the more important earlier writings on cowpox, contain also the author's original observations (with plates), of cowpox in Wiltshire in 1887–88.

manipulations of the milkers." Men milkers are well known to lack the delicate tact of women; and cowpox has been most common in the great dairying districts where men-milkers are employed. But in some animals cowpox may be produced even under gentler handling or with slighter provocation, of which I give a recent case from my notebook, taken during a visit to the country:

> 27 April, 1891. Case of cowpox. A maid in the service of Mr J. R. has on the ulnar side of the fore finger of the right hand, over the joint of the first and second phalanges, a collapsed bleb the size of a sixpenny piece, pearly white round the margin, bluish towards the centre, which is brown. The forefinger, as well as the wrist and hand generally, bears traces of recent inflammation, and was said to have been greatly swollen and painful, the pain extending up the arm. There is a symmetrical rash of bright red papules on both arms as high as the elbows, more copious and bright on the right arm but abundant on the left also. The papules are elevated and pointed, with a small zone of bright redness of the skin round the base of each. The history is as follows: A cow was bought four or five weeks ago to supplement the supply of milk from the three ordinarily kept. The new comer proved "tough" to milk, so that the maid was obliged, contrary to usual practice, to take the paps in the cleft of the fore and middle fingers; under this mode of "stripping," the animal would hardly stand quiet to be milked. After a time it was found that one of the paps had a black crust upon it, which might have covered originally a chap of the skin. The crust would have been displaced in the milking, and would have grown again; the sore beneath soon healed. Only one pap was affected. None of the other cows was infected. The "tough" cow was at length sold as an unsatisfactory milker, and had been sent to a distance on the morning of the day on which these notes were made. The maid's finger began to be affected after two or three weeks of milking the cow, the beginning of the large and tumid bluish-white vaccine vesicle having been like a small wart.

Jenner's opinion that cowpox was a specific disease "coeval with the brute creation," and that it had been the parent of the great historical smallpox of mankind, is not now received as correct. His other opinion, that cowpox was derived from the hocks of horses affected with "grease," which held a central place in his original essay, especially in connexion with his doctrine of "true" and "spurious" cowpox, was rejected by most of his contemporaries, and is perhaps unsupported by anyone at the present time[1].

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[1] In my essay of 1887 (u. s.) I maintained, as an original opinion, that the true affinity of cowpox was to the great pox of man, and that the occasional cases of so-called vaccinal syphilis were not due to the contamination of cowpox with venereal virus but to inherent (although mostly latent) properties of the cowpox virus itself. This opinion was at first received with incredulity, but is now looked upon with more favour. See Hutchinson, *Archives of Surgery*, Oct. 1889, and Jan. 1891, p. 215. The concessions hitherto made are only for cases that have arisen since my book was published, such as the case at the Leeds Infirmary in 1889. I believe that my explanation of vaccinal "syphilis" will at length be accepted for all cases, past or future.

In the title-page of his first essay, Dr Jenner called this singular malady of the cow's paps by a new name—*variolae vaccinae*, or smallpox of the cow. Pearson, the earliest and most ardent of Jenner's original supporters, and for several years thereafter a convinced vaccinist, at once took exception to the name *variolae vaccinae* "for the sake of precision of language and justness in thinking." It is a palpable catachresis, says he, to designate what is called the cowpox by the denomination *variolae vaccinae*, because the cowpox is a specifically different distemper from the smallpox in essential particulars, namely, in the nature of its morbific poison and in its symptoms[1].

That the term *variolae vaccinae* in Jenner's title-page is used tropically can hardly be doubted; but it is not so easy to say which of the great classical tropes it is. It may be objected that "catachresis" is too general for the misuse of a word when that word is a scientific one and occurs in the leading title of a scientific book. Here we have the somewhat specific and purposeful use of a word in an unwonted sense, which, if it fall under any of the scholastic figures of speech, ought to be a figure more specifically defined than mere catachresis. In a matter so important as this one should find the exact figure if possible; but at the outset a difficulty arises, namely whether we should look for it in the usage of the rhetors, as Isocrates teaches, or in the usage of the logicians, as Aristotle lays down the definitions of tropes. If among the former class, the nearest is perhaps the hypocorisma, or attractive, agreeable name for something that is not so nice in itself. If among the latter, we shall hardly find a better than the metalepsis, which is a change more of mood than of meaning, namely the transition without proof from a supposition to an assertion. But in truth no single figure of the ancient teachers suits this modern instance. We require at least two. Metalepsis carries us so far, but synecdoche must supplement it. The term *variolae vaccinae* is a synecdoche in that it names the cause from the effect; it is a metalepsis in that it passes abruptly from the hypothetical mood to the categorical; and in respect that it does both at a stroke it is probably unique, and without precedent among the examples known to the ancients. Or again, leaving the graver figures, and translating the Latin name of Jenner's title-page, one may try the figurative conversion of cowpox into smallpox by the standard of pure and legitimate

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[1] *An Inquiry, &c.* 1798. "Remarks on the term Variolae Vaccinae."

paronomasia, of which there is a familiar English example in the conversion of a plant into an animal by the verbal play of horse-chestnut and chestnut horse in the minor premiss.

Some in more recent times, mistaking the figurative or rhetorical intention of Jenner, have understood his Latin name of cowpox as if there really were a smallpox of the cow (although not of the bull, nor of the steer, the maiden heifer or the calf of either sex). Not being able to find a smallpox of the cow in the natural way, they have thought to satisfy the legitimate requirements of proof by manufacturing it. Certain Germans of the Lower Rhine, where the cows ordinarily wear blankets, have wrapped the blankets taken from smallpox beds round the bodies of cows, after clipping the hair close; nothing was found to ensue in these interesting experiments except an occasional pimple which had probably been caused by the shears in the preliminary clipping. Others in England, France, America and India, have succeeded in raising a smallpox pustule at the point of puncture in the epidermis of the cow or in the more delicate transitional epithelium, the matter from which has produced smallpox in its turn[1]. But these are academic exercises. The natural cowpox of the cow has been likened by none to the natural smallpox of man in a sustained comparison of all the anatomical and epidemiological particulars of each; nor, I am persuaded, will anyone ever attempt to draw out such a comparison. *Variolae vaccinae* as a name for cowpox was a figure of speech, and it is to misunderstand its original use to treat it as anything else.

The proof that cowpox had some power over smallpox consisted in trying to inoculate with the latter those who had been previously inoculated with the former. The accepted mode of testing the power of inoculated smallpox itself was to inoculate it again; at first the test for cowpox was to inoculate with smallpox, but after a few years the testing inoculation was done with cowpox itself. The effects of Suttonian inoculation with smallpox, as we have seen, were nearly always slight, and sometimes invisible (as in Watson's practice at the Foundling

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[1] That Dr Jenner foresaw this line of proof, and dismissed it as irrelevant, is made clear by G. C. Jenner, *Monthly Magazine*, 1799, p. 671, in reply to Dr Turton, of Swansea: "It is possible that variolous virus inserted into the nipples of a cow, might produce inflammation and suppuration, and that matter from such a source might produce some local affection on the human subject by inoculation. But all this tends only to show, what was well known before, that virus taken from one ulcer is capable of producing another by its being inserted into any other part of the body."

Hospital). A previous inoculation with cowpox made them slighter still; but even with cowpox in the system, the pustules of smallpox rose where the matter had been inserted on the arm. It may be thought that there were only fine shades of difference between the effects of inoculation after cowpoxing and the effects of the same in a virgin soil; but some difference must have been perceived, for it was upon that, and upon nothing else, that the authority in favour of cowpox as a substitute for smallpox in inoculation was promptly established. The relationship between cowpox and smallpox was admitted by all to be in the nature of things "extraordinary," as Jenner said, or a mystery, as others said; but as an empirical fact many believed it to be true, because the cowpoxed had less to show for the effects of inoculation with smallpox than if they had not been cowpoxed. Jenner himself is known to have made only two variolous tests. He used crude or watery matter from the local pustule of inoculated smallpox, and advised all his readers to do the same. In one of his two trials a child Mary James had nearly the same effects from inoculation after cowpox that her mother and another child had from it without having been cowpoxed, namely the pustule or confluent group of pustules at the place of puncture, and the eruptive fever at the ninth day[1].

In the earliest tests made independently of Jenner, five at Stonehouse[2], near Stroud, and five at Stroud[3], in the first months of 1799, the cowpoxed received smallpox afterwards by inoculation "in the usual slight manner." In the practice at the Smallpox and Inoculation Hospital, London, in the spring and summer of 1799, many of the cowpoxed took smallpox by contagion from the atmosphere of the hospital, so that Woodville, after a period of perplexity, at length concluded that cowpox, while it was still active upon the arm, did not shut out the action of the smallpox virus in the constitution[4].

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[1] Jenner, *Further Observations on the Variolae Vaccinae*, 1799.

[2] Thornton, in Beddoes' *Contributions to Physical and Medical Knowledge*. Bristol, 1799.

[3] Hughes, *Med. and Phys. Journ.* I. (1799), p. 318. Many other tests, English and foreign, are detailed in my book, *Jenner and Vaccination*. London, 1889, for which see the Index under "test."

[4] Woodville tabulated 511 cases of applicants for inoculation at the hospital in whom cowpox matter was used, giving "the number of pustules" opposite the name of each; 90 had from a thousand to a hundred pustules, 215 had less than one hundred. William Woodville, M.D., *Reports of a Series of Inoculations for the Variolae Vaccinae or Cowpox; with remarks on this disease considered as a substitute for the Smallpox*. London, 1799. In a subsequent letter (*Med. Phys. Journ.* V.,

The antecedent objections to cowpox, arising out of its non-variolous nature, were met by appealing to the results of experiments. The authority in favour of cowpox was speedily established on that ground, and has been continuous to the present time. The experimenters had to decide very nice points both in the way of observation and of reasoning. They had to appraise the margin of difference between the effects of Suttonian inoculation where cowpox had preceded and where it had not preceded. They had to allow for the first virus causing a swelling in the absorbent glands, which would obstruct the entrance of the second testing virus into the blood. They had to average the varying effects of Suttonian inoculation for its own sake, and the equally varying effects of it as the variolous test, and to find a broad difference between the two averages. Having decided that preceding cowpox infection did make a real and appreciable difference to the number of pustules resulting, at the spot or elsewhere, from the insertion of inoculated smallpox matter, or to the amount of fever, they had next to consider whether that degree of resistance by a cowpoxed person to inoculation were a good measure of his power to resist contagion reaching his vitals in the natural way. Their diligence and acumen may or may not have been equal to these things—it was a slack tide in medical science. Also they received little or no help from Dr Jenner himself, whose inventive genius was of the kind that is apt to leave the practical value, and even the theoretical probability, of the project to be tried by others. The inventor made interest with great personages—with the king, the duke of York, and the aristocracy of his county. His priority, and the merits of his project, were referred in 1802 to a

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Dec. 1800), he thus explained the occurrence of smallpox among those recently inoculated with cowpox: "If a person who has been exposed to the contagion of smallpox for four or five days be then inoculated for this disease, the inoculation prevents the effects of the contagion, and the *inoculated* smallpox is produced. But if the vaccine inoculation be employed in a case thus circumstanced, the smallpox is not prevented, although the tumour produced by the cowpox inoculation advance to maturation. It was not before the commencement of the present year [1800], that I ascertained that the cowpox had not the power of superseding the smallpox. For, though from the first trials that I made of the new inoculation it appeared that these diseases, as produced in the same subject from inoculation, did not interrupt the progress of each other; yet as the casual does not act in the same manner as the inoculated smallpox, and may be anticipated by the latter, I thought it still probable that the cowpock infection might have a similar effect. Numerous facts have, however, proved this opinion to be unfounded, and that the variolous effluvia, even after the vaccine inoculation has made a considerable progress, have in several instances occasioned an eruption resembling that of smallpox."

Committee of the House of Commons, with Admiral Berkeley as chairman, which entered on its labours with a strong recommendation from the king, endorsed by Addington, the prime minister. They decided in favour of Dr Jenner's claim for remuneration on all the issues, and on 2 June, 1802, the Committee of the whole House unanimously voted: "That it is the opinion of the Committee that a sum not exceeding £10,000 be granted to his Majesty to be paid as a remuneration to Dr Edward Jenner for promulgating the discovery of the Vaccine Inoculation, by which mode that dreadful malady the smallpox was prevented[1]." On 29 July, 1807, a farther sum of £20,000 was voted to him; and on 8 June, 1808, a National Vaccine Establishment was appointed, at an annual cost of about £5,000.

Chronology of epidemics resumed from 1801.

In resuming the history of smallpox from the beginning of the present century, we come first to the deaths in the London Bills of Mortality, which are the only continuous figures. The bills of Parish Clerks' Hall had failed, before they ceased, to include more than two-thirds, perhaps not much more than a half, of all the deaths in the capital. The great parishes of St Pancras and St Marylebone, which returned a somewhat excessive share of the deaths both from smallpox and from fever in the first two or three years of the Registration Act (1837–39), as well as the parishes of Chelsea and Kensington, were never included within the Bills; also much of the suburban extension on the other sides of London was never taken in. Meanwhile the area of the old Bills had actually become less populous owing to the displacement of dwelling houses by warehouses, workshops, counting houses, and the like, in the City, the Liberties and in certain out-parishes such as those bordering the Thames at the east end.

Still, the bills of mortality may be taken as showing on the whole fairly the proportion of smallpox deaths to other deaths, and the years of its greater outbursts.

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[1] *European Magazine*, XLIII. 137.

Smallpox in the London Bills of Mortality, 1801–37.

	Smallpox deaths	All deaths		Smallpox deaths	All causes
1801	1461	19,374	1820	722	19,348
1802	1579	19,379	1821	508	18,451
1803	1202	19,582	1822	604	18,865
1804	622	17,034	1823	774	20,587
1805	1685	17,565	1824	725	20,237
1806	1158	17,938	1825	1299	21,026
1807	1297	18,334	1826	503	20,758
1808	1169	19,954	1827	616	22,292
1809	1163	16,680	1828	598	21,709
1810	1198	19,983	1829	736	23,524
1811	751	17,043	1830	627	21,645
1812	1287	18,295	1831	563	25,337
1813	898	17,322	1832	771	28,606
1814	638	19,283	1833	574	26,577
1815	725	19,560	1834	334	21,679
1816	653	20,316	1835	863	21,415
1817	1051	19,968	1836	536	18,229
1818	421	19,705	1837	217	21,063
1819	712	19,928			

The 18th century had ended with a severe epidemic of smallpox (2409 deaths) in the year 1800; and excepting in the year 1804, the deaths kept at a somewhat high level for ten years longer. The rise at the end of the last century corresponded to a time of distress and a severe epidemic of typhus fever. The fever declined after 1803, and remained for a dozen years at so low a level that Bateman, in his quarterly reports on the practice of the Carey Street Dispensary, expresses surprise that there should have been so little of it. The same writer, however, has occasion to remark upon the fatality of smallpox; twice he mentions large mortalities from it in courts adjoining Shoe Lane[1]. According to the figures, also, smallpox declined less than fever. This means that, in the same circumstances, adult lives fared better than infancy and childhood. But, on the whole, smallpox shared with fever the advantageous conditions for health which obtained in all parts of the kingdom (in Ireland as well as in Britain) from the decline of the epidemics of 1799–1803 until the rise of the next epidemics in 1816–19. This period of comparative freedom from smallpox and fever

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[1] Bateman, u. s. 1819, Aug.–Nov. 1807: "In a court adjoining Shoe Lane, in the course of one month, twenty-eight persons had died of smallpox." Autumn, 1812: "In one small court in Shoe Lane, seventeen have lately been cut off by this variolous plague." Also in the summer of 1812, "perhaps universally through the metropolis."

corresponded to the second period of the great French War from its resumption after the failure of the Peace of Amiens until its termination with the Peace of Paris. It may seem surprising that this should have been a time of comparatively good public health in Great Britain and Ireland, inasmuch as it was a time of dear food and heavy taxes. The amount of typhus or relapsing fever is the best test; and those diseases, by all accounts, were at a lower level in all parts of the United Kingdom from 1804 to 1817 than they had been for many years before or than they were for many years after. Again, if precedents count for anything, the same kind of lull in smallpox and fever together is shown in the London bills during the war of the Allies against Louis XIV., and during the Seven Years War.

In Glasgow the decline of smallpox deaths for a few years in the 19th century was perhaps more marked than elsewhere because it was a decline from an excessively high level in the end of the 18th century.

Glasgow Mortalities, 1801–12.

Year	Smallpox deaths	Measles deaths	All deaths	Year	Smallpox deaths	Measles deaths	All deaths
1801	245	8	1434	1807	97	16	1806
1802	156	168	1770	1808	51	787	2623
1803	194	45	1860	1809	159	44	2124
1804	213	52	1670	1810	28	19	2111
1805	56	90	1671	1811	109	267	2342
1806	28	56	1629	1812	78	304	2348

Here it is not until 1805 that a marked fall in the smallpox deaths takes place. In Norwich there was a clear interval from the last severe period in the end of the 18th century, until the year 1805, when smallpox, "after being for a time almost extinct," became prevalent again. At the Whitehaven Dispensary, the contrast between the last years of the 18th century and first years of the 19th is not striking[1]:

Smallpox at Whitehaven Dispensary.

	Cases	Deaths		Cases	Deaths
1795	8	0	1800	120	11
1796	41	5	1801	9	3
1797	(no table)		1802	(no table)	
1798	51	3	1803	67	16
1799	7	1	1804	1	0

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[1] Extracted from the Annual Reports of the Dispensary.

Carlisle, which used to share in smallpox as much as Whitehaven, seems to have been almost wholly free from it in the first twelve years of the century: at least Dr Heysham, who was no longer statistical, "had reason to believe" that no person died there of smallpox from the autumn of 1800 (when cowpox inoculation was introduced) until November, 1812[1].

The Newcastle Dispensary, like that of Whitehaven, treated a small fraction of all the cases of smallpox in the town; but it continued to have a fair average of cases and deaths after the century was turned:

Smallpox cases attended from Newcastle Dispensary.

	Cases	Deaths		Cases	Deaths
1795	7	1	1801	14	4
1796	19	3	1802	—	–
1797	12	0	1803	7	4
1798	15	3	1804	0	0
1799	—	–	1805	7	0
1800	—	–	1806	16	6

Most places continued to have their periodical epidemics of smallpox as before, although both measles and scarlatina were becoming more and more its rivals. Boston, Lincolnshire, had its sexennial epidemic in 1802 with thirty-three deaths. Besides the year 1805, there were two periods in which smallpox was somewhat general, 1807–9 and 1811–13. At Norwich from 1807 to the end of 1809 the bills of mortality showed 203 deaths from smallpox[2]. In 1808 we happen to hear of it also at Sherborne, in Dorset, at Ringwood, in Hampshire, at Cheltenham, at Cambridge and at Edinburgh, although the great epidemic malady of children in that year was measles[3]. Lettsom wrote on 25 January, 1808: "The smallpox (infanticides) and measles have been prevalent and fatal. The coffins for the parish poor in England for the smallpox deaths alone have cost £10,000[4]."

In 1811 it began to be somewhat general again, and rose in London to a considerable epidemic in 1812, the deaths in

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[1] Heysham to Joshua Milne, in the latter's *Treatise on the Valuation of Annuities*. London, 1815. App. p. 755.

[2] Cross, 1819, u. i. p. 2.

[3] Most of these were brought to light by inquiries upon the alleged failures of cowpox to avert the epidemic. The serial numbers of the *Medical Observer* contain frequent references to them.

[4] Letter to Joshua Dixon, in *Memoirs*, III. 368.

summer rising to sixty in a week[1]. A village epidemic of 46 cases and 7 deaths is reported from North Queensferry, near Edinburgh, from 14 December, 1811 to 7 March, 1812[2]. At Norwich from 10 February to 3 September, 1813, there were 65 deaths[3]. The rise from 1811 to 1813 coincided with an increase of fever, the winter of 1811–12 having been a time of dearth and depressed trade, especially in the manufacturing districts. After that came a notable lull both in fever and smallpox, which was at length broken by the epidemics of each in 1817 in Ireland, Scotland and England, coincidently with the depression of trade and dislocation of commerce that began everywhere as soon as the great war was over.

The Smallpox Epidemic of 1817–19.

The same things that favoured the prevalence of typhus and relapsing fever in times of distress, favoured also the rise of smallpox to the height of an epidemic. Hence the greater epidemics of smallpox in the first half of the 19th century coincided somewhat closely with epidemics of relapsing or typhus fever,—in 1817–19, in 1825–27, in 1837–40, and in 1847–49. That which fever was to the adolescents and adults in times of distress, the same was smallpox to the infants and young children. The young children of a family did, indeed, take fever sometimes as well as the parents or the young persons in it; but the children seldom died of it. They died of smallpox (or of measles or whooping cough or the like), perhaps all the more readily that they would have been weakened by the fever, and by the want of food and comforts which attended it. Thus, while fever and smallpox went somewhat closely hand in hand during times of distress, it was the adolescents and adults that died of fever, the infants and young children that died of smallpox. The following table, compiled from the reports of the Whitehaven Dispensary from 1783 to 1800, will show how many children survived attacks of continued fever in comparison with their elders[4]:

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[1] Bateman, *Edin. Med. Surg. Journ.* VIII. 515.

[2] C. Stuart, *ibid.* VIII. 380.

[3] Rigby, *ibid.* X. 120.

[4] Joshua Dixon, *The Literary Life of William Brownrigg, M.D.* Whitehaven, 1801, pp. 238–9.

Continued Fever at Whitehaven Dispensary, 1783—1800.

	Total	Under 2 years	2—5	—10	—15	—20	—30	—40	—50	—60	—70	—80
Cases	1712	40	142	240	223	150	240	236	202	92	47	15
Deaths	85	0	0	5	2	6	14	20	19	12	7	0

The deaths from smallpox are found nearly always to be high when the deaths from fever are high. The correspondence, however, is not always exact to months or quarters, or half-years; for it is not unusual in the London weekly bills to find a run of weeks with high deaths from smallpox just before or after a run of weeks with high deaths from fever. The domestic circumstances which spread the contagion of fever were such as might be expected to spread the contagion of smallpox, namely, the pawning of clothes, bedding and the like, on a vast scale in times of scarcity, the crowding of many in single rooms or in one bed, the wandering of men and women, attended by their children, in search of work, the exposure of children in the smallpox so as to extort alms. All these things were common in Ireland, Scotland and England during the long periods of depressed trade, alternating with periods of speculation and expansion, for which the generation following the Peace of Paris was remarkable. We hear far more of the fever than of the smallpox, because the former touched the lives of breadwinners, while the latter was often regarded as a matter of course[1]. Thus, in the Irish famine of 1817–18, it is possible to estimate the prevalence of dysentery, relapsing fever and typhus fever by the aid of various records, including two treatises and the reports of a Parliamentary Committee. There are also two or three brief references to smallpox; but no one would have supposed that smallpox caused actually more deaths than fever itself, as in the following returns of burials in the Cathedral churchyard of Armagh, from 1st May to 25th December, 1818[2]:

Smallpox deaths	180
Fever deaths	165
All other deaths	118

—the total of 463 being twice or thrice the numbers for the corresponding months of non-epidemic years. Whether there was as much smallpox in other provinces of Ireland as in

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[1] Haygarth says: "With us in Chester, smallpox is seldom heard of except in the bills of mortality. *There* its devastation appears dreadful indeed." *Sketch of a Plan*, *&c.* 1793, p. 491.

[2] Barker and Cheyne, *Account of the Fever*, *&c.* 2 vols. 1821. I. 92.

Ulster, does not appear; but the following relating to Strabane and Londonderry will serve to prove that Armagh was not exceptional in the north of Ireland. In and around Strabane, smallpox began to spread in May, 1817, having been hardly known in the neighbourhood for years before; it was often confluent and was "fatal to hundreds" of children[1]. The same severity of the epidemic is reported also from the county of Derry in 1817: "Cases of smallpox appeared in greater numbers than I had ever before witnessed, even previous to the valuable discovery of Jenner[2]."

The vagrancy of the Irish peasants, not only cottiers but also many small farmers, began in Ulster in the end of the year 1816, after a wet autumn which ruined the crops; and it is probable that the contagion of smallpox began to be spread among their children about the same time. Whether a migration set in to England and Scotland at that time is not clear. It appears, indeed, that the first of the epidemic in England, in Whitehaven, Ulverston, and other places which were in direct communication with the North of Ireland, was at least as early as, and perhaps earlier than, the outbreak of the malady in that country. The whole of the United Kingdom was suffering in 1816 from depression of trade, and many of the labouring class were tramping from place to place in search of work. The following is the account of smallpox being brought to Ulverston[3]:

"The smallpox were brought to Ulverston from Wigan, by the wife of a nailer, who, with her child had slept in a house where the family had just recovered from them, in the latter end of January, 1816, or beginning of

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[1] Francis Rogan, M.D., *Obs. on the Condition of the Middle and Lower Classes in the North of Ireland*. Lond. 1819, p. 17. He proceeds to say:—"The numerous cases, which came to my knowledge, of children in the neighbouring towns who had taken smallpox, after having been vaccinated by medical practitioners of high respectability, led me to pay particular attention to those whom I myself inoculated [with cowpox]; and, although they were numerous both in private practice and at the Dispensary, not one instance occurred among them." It comes out however that he did not keep them long in sight; he saw them on the 7th day after vaccination, and again on the 11th; and as they were meanwhile almost daily exposed to contagion, without catching it, he concluded that his own cases never would do so.

[2] W. L. Kidd. "A concise Account of the Typhus Fever at present prevalent in Ireland, as it presented itself to the Author in one of the towns in the North of that country." *Edin. Med. and Surg. Journ.* XIV. (1817), 144. He goes on: "A great number of those attacked were *reported* to have been formerly vaccinated. At Londonderry, in particular, great numbers who were *said* to have undergone vaccination were the subjects of smallpox; and, whether justly or not, vaccination has in that part of the country lost much of its credit as a preservative against smallpox."

[3] Redhead (dated Ulverston, 3 July, 1816) in *Med. and Phys. Journ.* Jan. 1817, p. 3.

February. She immediately returned to Ulverston and the eruption appeared on the child about ten days afterwards, when it was carried about by the mother and much exposed in different parts of the town. They soon removed from this place; and I believe the child died between this place and Kendal."

A young woman of Ulverston who was much in the company of the nailer's wife from Wigan, caught smallpox from her child, and died on 22 February; her sister sickened soon after, and had the disease favourably. An epidemic followed in the town, of which some particulars are known down to October, 1816; the disease was very fatal also in Whitehaven at the same time. Two things gave a particular interest to the Ulverston smallpox of 1816, two things which were found to characterize the epidemic everywhere in England and Scotland as it spread in 1817, 1818 and 1819. These were, first the numerous cases of smallpox among those who had been inoculated with cowpox, a sequel now obvious on a large scale for the first time; and secondly, the admixture of a good many cases of "crystalline" or "hornpox" eruptions among the usual pustular cases. There was nothing new in such crystalline eruptions in smallpox; for example Huxham mentions them at Plymouth in 1752. But they were always curious, and it was always a matter of wonder that they should happen in one epidemic and not in another. Of thirty-five cases tabulated from the Ulverston epidemic of 1816, twelve had the "horny pox," or the "small horny kind," all the rest having the ordinary pustules of smallpox, sometimes discrete, sometimes confluent, four being scarred, and one covered by "a complete cake of incrustation." All those thirty-five cases were above five years of age, except one child of three, and they seem to have nearly all recovered. Nothing is said of the infants and children under the age of five, who then contributed three-fourths of the mortality in every epidemic of smallpox. The crystalline eruption was not chickenpox; for the three first cases of it had all gone through chickenpox before.

Almost identical in tenour with this account from Ulverston is the narrative of an epidemic at Newton Stewart, in Wigton, just across the Solway from Cumberland, which began in the autumn of 1816, but did not extend until the following summer[1]. The first case was one of "hornpox" in a girl from London;

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[1] James Black, "On Anomalous Smallpox." *Ed. Med. and Surg. Journ.* Jan. 1819, p. 39.

the second case was in a companion of the former, in the same family, her disease being ordinary pustular smallpox; both had been vaccinated. One hundred cases in the epidemic were thus assorted:

	Cases	Deaths
Smallpox	43	13
Modified hornpox, &c.	47	0
Varicella	10	0

That is to say, the mortality of the whole was thirteen per cent., an ordinary mortality for a country town. There were all extremes, from confluent smallpox to discrete, many of the discrete having no proper pustules "but hard vesicles of more or less tubercular appearance... These were termed by the people *nerles* or *hornpox*, and have long been noticed by very aged matrons, who pretend to no little skill in the diagnostics of smallpox, and who have distinct varieties by name, beyond the enumeration of any nosologist." Their diagnostic skill was natural enough, for the practice in smallpox had been almost entirely in their hands.

A certain proportion of hornpox cases was so characteristic of this epidemic (1816–19) as to have been remarked everywhere —in England as well as in Scotland. The epidemic was not well reported as a whole at any one place. Sometimes, as at Ulverston, only the vaccinated cases were given; at other times, as at Cupar Fife and Edinburgh, only the "hornpox" cases were given; again, in the account of the Norwich epidemic, which is the fullest, the large number of cases with crystalline or horny eruption were not counted in as smallpox cases at all. Dewar's table of the Cupar Fife epidemic, in the spring of 1817, included 70 cases, all of crystalline or hornpox[1]. The latter variety was part of the epidemic at St Andrews[2].

The Edinburgh cases which Thomson heard of to the end of the epidemic numbered 556, assorted as follows[3]:

310 had been vaccinated.
41 had had smallpox (doubtless by inoculation).
205 had neither been vaccinated nor had smallpox.

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[1] Henry Dewar, M.D., *Account of an Epidemic of Smallpox which occurred in Cupar in Fife in the Spring of* 1817. Lond. 1818.

[2] P. Mudie, M.D. to Thomson, 18 Oct. 1818: "Many of the cases occurring after vaccination so much resembled smallpox that, if my mind had not been prejudiced against the possibility of such an occurrence, I should have pronounced the eruption to have been of a variolous nature"—which, of course, it was.

[3] Thomson, *Account of the Varioloid Epidemic in Scotland, &c.* Edin. 1820.

A large proportion had the crystalline eruption, while some of the deaths are put down to "malignant crystalline water-pock." At Lanark and New Lanark the epidemic was also taken notice of[1]. At the latter were situated the cotton mills managed under Robert Owen's co-operative system; and it appears that vaccination had been somewhat generally carried out in this socialist community. The following was the incidence of smallpox upon 322 persons:

251 had been vaccinated.
3 were under vaccination at the time.
11 had been inoculated with smallpox, or had gone through the natural smallpox.
57 had neither been vaccinated nor variolated.

It is clear that this was the first severe and general epidemic in Scotland since the beginning of the century, although we have seen that the disease had never been out of Glasgow. Thomson saw well enough how that epidemiological fact told: "It is to the severity of this epidemic, I am convinced, that we ought to attribute the greatness of the number of the vaccinated who have been attacked by it, and not to any deterioration in the qualities of cowpox virus, or to any defects in the manner in which it has been employed. [Dewar said the same for Cupar Fife.] Had a variolous constitution of the atmosphere, similar to that which we have lately experienced, existed at the time Dr Jenner brought forward his discovery, it may be doubted whether it ever could have obtained the confidence of the public." Thomson himself, professor of military surgery in Edinburgh and a person of high character, drew the most astonishing inferences from the tolerably simple facts of the epidemic in 1817-19. The crystalline was mixed with the ordinary pustular smallpox in this epidemic, as it had been in some 18th century epidemics; it was common to those who had been vaccinated and to those who had not been so; it occurred in those who had previously gone through the chickenpox. Yet the professor concluded that crystalline or hornpox was smallpox "modified" by vaccination, that it should be called "varioloid," and that "modified" smallpox and chickenpox were the same disease.

Several cases of smallpox had occurred in the spring of 1816 at Quarndon, two miles from Derby, one or two of the nine cases proving fatal. Several of the Derby doctors went to see them,

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[1] In Thomson, u. s.

some calling them "aggravated chickenpox," and others "mild smallpox after vaccination." In the spring following (1817), most of the children and young people in the villages of Breadsall, Smalling, Spondon, Heaver, and others near Derby, were afflicted with the epidemic, which declined in autumn. It came back in the spring of 1818, when it spread more generally than before, and was still prevalent at the end of that year, in Nottinghamshire and Staffordshire as well as in Derbyshire. In Herefordshire, also, in February, 1818, "typhus, measles and smallpox were at once raging." The disease proved fatal in many instances among the lower orders in Derbyshire, who still followed the heating regimen, giving the children saffron to drink, and holding them in blankets before a strong fire, to bring the eruption out; but it was fatal also to some who were treated more rationally. In this part of England, as in Lancashire, Wigtonshire, Fifeshire, Edinburgh, and elsewhere, a large proportion of the cases had the crystalline eruption of smallpox, horny or glassy pimples or hard vesicles, which dried about the sixth day. But, said Dr Bent, the peculiar form "is the same in those persons who have never had the cowpox and in those who have passed through that disease satisfactorily." His two drawings of the characteristic hornpox were made from unvaccinated children. On the very day of his writing he had seen two children in the same family, both with the crystalline eruption, the one vaccinated and the other not. In his practice at the Derby Infirmary, one in-patient and one out-patient had died of smallpox after vaccination, and one out-patient had died of it who had not been vaccinated. He was greatly astonished, after all that had been said of the certainty of cowpox protection[1].

The epidemic of 1817–19 was longest in reaching the Eastern Counties, just as that of 1741–42 had been, and that of 1837–39

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[1] Thomas Bent, M.D., "Observations on an Epidemic Varioloid Disease lately witnessed in the County of Derby." *Med. and Phys. Journal*, Dec. 1818, p. 457. One Jennerian, Dr Pew, of Sherborne, adopted an arrogant tone towards Bent (*Ibid.* April, 1819, and farther correspondence). Jenner employed Fosbroke, of Berkeley, son of his friend and neighbour the antiquary Fosbroke, to traverse the whole case of the epidemic of 1817–19, in a long paper in the *Medical Repository* for June, 1819. The object of the paper appears to be to confuse the issues with a view to a verdict of *non liquet*. The *Edinburgh Review* thought Thomson's book on the epidemic of 1817–19 important enough for an article, which has been attributed to Jeffrey. The article pronounced vaccination to be a very great blessing to mankind, but not a complete protection. This was not enough for Jenner, who wrote of the article: "It will do incalculable mischief: I put it down at 100,000 deaths at least."

was to be. It was also towards the close of 1818 and beginning of 1819 that the disease became frequent in Canterbury. When it did reach Norwich, Lynn and many other places in Norfolk and Suffolk it became unusually destructive. The history of smallpox in Norwich from the beginning of the century was a history of the usual periodic epidemics, such as the city had been visited by in former times, according to the records in Blomefield's *History* or other sources. The first epidemic was in the year 1805, when smallpox was unusually common in London also. The next, with 203 deaths, lasted from 1807 to 1809. In 1813, the bills again showed many deaths by it from 10 February to 3 September. For fully four years after that there was not a death from smallpox reported in Norwich. In June, 1818, by which time the epidemic had reached large dimensions in Ireland, Scotland, and part of England, it was brought to Norwich by a girl who had come with her parents from York; it spread little at the time, the deaths to the end of the year being only two. Meanwhile measles was a very frequent and fatal disease among the children in Norwich throughout the year 1818. The smallpox began to rage in April, 1819, after which the measles was hardly met with, and only a few cases of scarlatina. The following table shows the enormous rapidity with which smallpox went through the infants and children of the Norwich populace when it had once fairly begun[1]:

1819	Deaths from smallpox	Deaths from other diseases	Total
January	3	61	64
February	0	71	71
March	2	68	70
April	15	61	76
May	73	63	136
June	156	70	226
July	142	61	203
August	84	63	147
September	42	96	138
October	10	63	73
November	2	62	64
December	1	83	84
	530	822	1352

In one week of June, there were forty-three burials from smallpox. Half the deaths were of infants under two years; nearly all the rest were of children under ten:

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[1] John Green Cross, *A History of the Variolous Epidemic which occurred in Norwich in the year* 1819. Lond. 1820.

Total	0—2	—4	—6	—8	—10	—15	—20	—30	—40
530	260	132	85	26	17	5	2	2	1

If the deaths were at the rate of one in about six cases, there would have been some three thousand children attacked in a population of 50,000 of all ages. Two hundred cases which Cross kept notes of were classified by him thus:

Mild	75	Confluent	42
Severe	78	Petechial	5

Forty-six of these died, a rather high rate of 23 per cent., which is due perhaps to the crystalline or hornpox cases being excluded from the definition of smallpox altogether; all the petechial or haemorrhagic cases died, and most of the confluent. Sloughing of the face, lips or labia, occurred in three children, and bloody stools in many of the worst cases. Those 200 cases occurred in 112 families, comprising 603 individuals, of whom nearly one-half (297) "had smallpox formerly" (including the inoculated form of it, doubtless).

This was a great epidemic for Norwich in the 19th century. The public health there, as elsewhere, had improved greatly since the 18th century. In 1742 the deaths had been increased 502 by smallpox; but in that year, a year of severe typhus, the deaths from all causes were 1953, against 1352 in 1819. One reason of the enormous smallpox mortality from May to September, 1819, was the number of susceptible children, all the greater that there had been hardly any smallpox for five years, whereas in towns such as Norwich in the 18th century it appears to have been perennial: all the greater, also, because "the removal of families from the country to Norwich, during a flourishing and improving state of our manufactures for two or three preceding years, gave a sudden increase to the number of those liable to the disease." Norwich may have been better off than many other towns; but the winter of 1816–17, when the smallpox epidemic began, was a time of depressed trade, many families being on the move in search of work; and it does not appear that all those who crowded to Norwich had found employment. The epidemic was "confined almost exclusively to the very lowest orders of the people;" the contagion was spread abroad among them by the shifts they were reduced to in their indigence—"the public exposure of hideous objects just recovering, loaded with scabs, at the street corners." Yet this

deplorable state of want and beggary does not seem to have been accompanied with much typhus fever among the adult population, as it certainly was in 1742. Cross describes a petechial fever, in May, June and July, 1819, which was fatal in all the cases that he was called to; but he speaks of it only among children. Whenever the population increases rapidly, as it had been doing in the second decade of the 19th century, it is upon the young lives that epidemic mortality falls most. The smallpox epidemic at Norwich in 1819 caused rather more deaths than in 1742, when the public health was very much worse; but it would hardly have caused so many had it not been aided by the state of population.

The epidemic of 1819 spread all over East Anglia[1]. At Lynn there had been a good deal of the disease three years before; in 1819 there were so many deaths from it that in June the clergy ordered the smallpox burials to be specially marked in the register, from which date until the end of August they numbered forty. At Yarmouth the epidemic was still raging at the end of 1819. Of ninety-one surgeons in Norfolk and Suffolk who replied to a circular issued by Cross, all but eleven saw cases of smallpox in 1819, three had had cases in 1818, two had seen the disease in 1817, and one in 1816. Generally speaking, the disease had been in abeyance in those counties for seven years; a surgeon of Prudham, whose practice covered eleven parishes, had seen no case of smallpox for twelve years before. The largest number of deaths in the practice of any one surgeon was twelve. Twenty-eight surgeons together had 598 smallpox patients, with 97 deaths; but in their districts there had been 180 deaths besides from the same disease, in families unvisited by them.

The accounts of this epidemic in London are most meagre. In the bills of mortality, now become quite inadequate to the whole capital, the deaths rose to 1051 in 1817, fell next year to 421, and in 1819 were 712. But it was in the year 1819 that the admissions to the smallpox hospital were most numerous, namely, 193, the highest number since the epidemic of 1805, when they were 280 in the year. The horny or crystalline kind of smallpox was found in London, as elsewhere[2].

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[1] Cross, u. s. Appendix.

[2] W. Shearman, M.D., "Cases illustrating the Nature of Variolous Contagion and the Modifying Influence of Vaccine Inoculation." *Lond. Med. Repos.* Dec. 1822.

In the spring of 1818, "smallpox *post vaccinationem*" was frequent among the boys of Christ's Hospital[1]. None of the cases proved fatal that year, but there was a death in the school from smallpox in 1820, probably the last fatality from that cause in the history of the school[2].

A few casual notices of smallpox in England in the years following the epidemic of 1817–19 lead one to suppose that the disease did not again fall to that apparent extinction which it had reached before the last epidemic began. It is heard of in and around Chichester in 1821; nineteen surgeons who supplied Dr John Forbes with information had seen about 130 to 140 cases, with 20 deaths; about 80 of the cases were in persons previously inoculated with cowpox, 19 cases (or the most of 19) were in persons previously inoculated with smallpox[3]. This was doubtless the experience of paying patients only; according to the East Anglian precedent of 1819 there would have been twice as much smallpox in families who received no professional treatment. Canterbury is another town from which a rapidly spreading epidemic of smallpox is reported—in the winter of 1823–4. It continued into the winter and spring of 1824–25, among the poor, fatal cases being by no means rare. Dr Carter frequently saw children exposed in the streets of Canterbury with smallpox upon them; he appealed to the mayor to have some check imposed on the spread of contagion, but nothing was done, and smallpox was still prevalent at the date of his writing in the autumn of 1824[4]. The same year there was a

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Case of a mother, with good vaccine marks, attacked with smallpox, which became dry and horny about the fifth day; case of her child, in which the eruption ran the full course of pustules, but also a mild case.

[1] *Lond. Med. and Phys. Journ.* May. 1818, p. 488: "By Mr Field's report of Christ's Hospital smallpox in a mild form has been frequent *post vaccinationem*."

[2] Thomas Stone, F.R.C.S. "Table of Deaths from Smallpox in Christ's Hospital, 1750 to 1850, with remarks," in Appendix to *Papers on the History and Practice of Vaccination: Parl. Papers*, 1857. In 1761 there were four deaths from smallpox. For ten years, 1775 to 1784, there were none. In some other years of the latter half of the 18th century there were one or two deaths from that cause. There must have been some special reason for the four deaths in 1761. According to Massey (*supra*, p. 545), the apothecary in the beginning of the 18th century, not one death happened in forty attacks, the ages from five to eighteen being the most favourable of all for smallpox to fall in. In the present century scarlatina has displaced smallpox as an infectious cause of death in that school as in others. The deaths from scarlatina at Christ's Hospital during the six years 1851–56 were nine.

[3] John Forbes, M.D., "Some Account of the Smallpox lately prevalent in Chichester and its Vicinity." *Lond. Med. Repos.* Sept. 1822, p. 208.

[4] H. W. Carter, M.D., in *Lond. Med. Repos.* Oct. 1824, p. 267: "The cases which came to light of smallpox after vaccination were unfortunately numerous; some, it must be confessed, were exceedingly severe; others were exaggerated."

severe epidemic at Oxford. These were probably only samples of epidemics filling the interval from 1819 to 1825, when smallpox again became general.

Extent of Inoculation with Cowpox or Smallpox, 1801–1825.

Twenty-five years had now passed since cowpox became the rival or substitute of the old matter of inoculation. The history at this point requires some notice of the extent to which each of those methods was practised. Professional opinion, or that part of it which found expression, was for the most part in favour of cowpox. The Smallpox and Inoculation Hospital of London took the lead, under Woodville, in substituting cowpox for smallpox, and other public institutions, such as the Newcastle and Whitehaven Dispensaries, quickly followed. The new mode was practised upon larger numbers than the old. At the Newcastle Dispensary the inoculations of smallpox from 1786 to 1801 had been 3268; the inoculations of cowpox from 1801 to 1825 were 20,264. At the Whitehaven Dispensary 173 children were inoculated with smallpox in 1796, the total inoculations before that having been 906. To the end of 1803 the total vaccinations were 490, of which many were done during the severe outbreak of smallpox in 1803.

In Glasgow, where the old inoculation was either little practised or of little use, the Jennerian mode was received with favour, and was offered to the children of the working classes gratuitously at the Hall of the Faculty of Physicians and Surgeons. From the 15th of May, 1801, to the 31st of December, 1811, these public vaccinations numbered 14,500, an average of about 1400 in the year. In the next seven years they declined as follows:

1812	950	1816	980
1813	1162	1817	820
1814	875	1818	650
1815	926		

On the revival of smallpox the Glasgow Cowpock Institution was opened on 28 August, 1818, and vaccinated 146 to the 1st of January, 1819. The smaller demand for even gratuitous vaccination of infants after 1812 was owing to the very small amount of smallpox in Glasgow in those years; in the six years, 1813–19, there were said (by Cleland) to have been only 236 deaths from

smallpox in a total of 22,060 deaths from all causes, or 1·07 per cent. of all deaths[1]. Not more than a fourth part of all the infants born in Glasgow had been vaccinated in the years 1812 to 1818, and that was the time when smallpox was at its lowest point among the infantile causes of death. In some of those years when smallpox was in abeyance measles was most destructive. It was currently said in Glasgow that vaccination, if it discouraged smallpox, predisposed to measles, an opinion of the populace which Malthus shared from the *à priori* point of view. But in a survey of the individual cases in their practice the Glasgow doctors did not find that those were the relevant circumstances, whatever the truly relevant things may have been. Thus, Dr Robert Watt, a good observer and cautious reasoner, who became president of the Glasgow faculty, wrote: "The only family within my knowledge where three died of the measles in 1808 was one where none of the children had been either vaccinated or had had the smallpox. I met with another family where two died in the same circumstances"—that is to say, five children, in two families, escaped smallpox to die of measles, no artificial interference having been attempted[2].

Manchester was another populous district where vaccination had been freely offered to the poorer classes. Roberton, writing in 1827, says that it had been on the decline for several years, and gives the following figures for the earlier period, May, 1815, to May, 1823[3]: At the Manchester Lying-in Charity the annual average of deliveries was 2667, while the number of infants brought back for vaccination averaged 1392 in a year. During the same eight years public vaccinations at the Manchester Infirmary averaged 1700 annually. Great numbers of infants were said, also, to have been vaccinated gratuitously by druggists. The decline in the number of vaccinations, which had perhaps begun some time before (as at Glasgow), was shown conclusively by the returns for the two years May, 1824—May, 1826. The births at the Lying-in Charity averaged 3285 per annum; but the vaccinations in the infants brought back to the charity,

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[1] The vaccinations are given in Cleland's *Rise and Progress of the City of Glasgow*. Glasgow, 1820. The smallpox deaths from 1813 to 1819 are given, on Cleland's authority, in the *Edin. Med. and Surg. Journal*, XXVI. p. 177.

[2] R. Watt, M.D., Appendix to *Treatise on Chincough*.

[3] John Roberton, *Obs. on the Mortality, &c. of Children*. Lond. 1827, p. 59, *note*.

together with those brought to the Manchester Infirmary averaged only 1309 per annum.

Newcastle, Glasgow and Manchester were probably favourable instances of the extent of public vaccinations in the firs quarter of the century. In London the proportion of vaccinations to births is known to have been smaller, although there was more money going and at one time four public charities—the Vaccine Pock Institution, the Royal Jennerian Society, Walker's offshoot from the latter, and the Inoculation Hospital. The following were the vaccinations at the Inoculation Hospital in four periods of five years each from 1806[1]:

1806—10	7,004
1811—15	9,339
1816—20	13,348
1821—25	16,666
	46,357

Annual average 2317.

At Norwich, Dr Rigby succeeded in 1812 in persuading the Board of Guardians to offer half-a-crown premium to parents for each child brought to be vaccinated. The premiums paid were as follows:

1812 (12 Aug.—31 Dec.)	1066	1815	11
1813	511	1816	348
1814	47	1817	49
		1818	64

—the annual births being from a thousand to twelve hundred[2].

At the Canterbury Hospital the applications for free vaccinations fluctuated as follows:

1818	52	1822	35
1819	249	1823	50
1820	263	1824 (Jan.—July)	588
1821	47		

The sudden rise in 1819–20 and again in 1824 was owing to smallpox being epidemic in the city. During the severe epidemic of 1824 there were 250 vaccinations at the Dispensary, besides the 588 at the hospital[3]. At Kendal the following is the Dispensary record of vaccinations for three years, the annual average of births being 390[4]:

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[1] Gregory, *Report of the London Smallpox Hospital for the year* 1825. Cited in the *Med. and Phys. Journ.* Feb. 1826, p. 176.

[2] Cross, u. s.

[3] Carter, u. s.

[4] T. Proudfoot, M.D., *Ed. Med. and Surg. Journ.* July, 1822.

1819	221
1820	102
1821	73

These are examples of the spasmodic demand for vaccination in the towns. The following is an instance of general vaccination in a village during an epidemic:

The village of North Queensferry, near Edinburgh, had a population of 390. There was an epidemic of smallpox from 14 December, 1811, to 7 March, 1812, during which time 46 children, from one to fifteen years, were attacked, and seven died, the same number that had died in the last epidemic, in 1797. When the epidemic was over there were only nine persons in the village, most of them aged, who had neither had smallpox nor cowpox. Those who had been vaccinated numbered 132; while of those "formerly vaccinated" only two were included among the 46 children who caught smallpox in 1811–12. The adult population must have nearly all gone through smallpox in former epidemics[1]. These general vaccinations during or towards the end of an epidemic were exactly comparable to the general inoculations by the old method. At Norwich, where a premium of half-a-crown was given to parents for each vaccination, the epidemic of smallpox in 1819 stimulated the practice somewhat, the increase in July and August having followed a public meeting of the inhabitants and a combined effort of the doctors:

	Progress of the mortality	Progress of premium vaccinations		Progress of the mortality	Progress of premium vaccinations
January	3	26	July	142	301
February	0	51	August	84	359
March	2	101	September	42	14
April	15	226	October	10	4
May	73	226	November	2	2
June	156	92	December	1	0

Cross estimated that a fifth part of the population of Norwich (50,000) were vaccinated—8000 before the epidemic of 1819, and 2000 during the epidemic. Many of the adults had been through the smallpox in the ordinary way in former epidemics. The state of vaccination throughout Norfolk and Suffolk was indicated in the answers made by ninety-one practitioners to the circular of queries sent out by Cross. Twenty-six had done 13,313 vaccinations during the epidemic of

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[1] C. Stuart, u. s.

1819. The whole number in the practice of those ninety-one from first to last had been 120,000, two of the practitioners having vaccinated none.

To sum up, as well as the records enable us to do, the extent of the new practice in the first quarter of the century, it was systematically carried out from year to year among the infants of large towns, such as Glasgow, Newcastle, Manchester and London, and in these the maximum of gratuitous vaccinations in proportion to the births may have been one-half. In smaller towns and in country parishes the inoculations of cowpox, like those of smallpox, appear to have been irregular or by fits and starts, the alarm of smallpox being the occasion for them. But after the epidemic of 1817–19, which was the most general since cowpox had been tried, it was not mere negligence or procrastination that kept parents back, it was distrust of the new practice and preference for the old.

The original mode of inoculation, with the matter of smallpox itself, was far from being supplanted by its rival. In Jenner's first essay the latter was put forward tentatively, not indeed because of any want of confidence in asserting its protective powers, but because it was only in certain circumstances that a substitute was desired for the old inoculation. Some of those who took up the new matter soon discontinued the old altogether, as at the Newcastle and Whitehaven Dispensaries. At the London Inoculation Hospital the old practice was given up for out-patients after 1807, and for in-patients about 1821. In private practice, tastes or preferences differed. While ordinary people left it to the discretion of their medical advisers, commissioning them to inoculate their children "with either kind of pock," the upper classes "judge for themselves, and those among them who are philanthropists and converts to the new faith inoculate their own children and those of the poor together[1]." Moseley, in 1808, said that the "mere operative practice" in cowpox, by which phrase he meant to contrast the academic countenance of it by eminent physicians and surgeons, had been "chiefly carried on by lady-doctors, wrong-headed clergymen, and disorderly men-midwives," Dr Pearson being named as the only man of letters or pretensions to science who had been practically concerned in it of late[2].

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[1] Dr Stokes, of Chesterfield, *Med. and Phys. Journ.* V. 17.

[2] Benjamin Moseley, M.D., *A Review of the Report of the Royal College of*

There was really little to choose between the new method and the old so far as concerned facility of operating; if anything, the inoculation of smallpox was the more difficult of the two, although that also was largely practised by amateurs[1]. Again, as regards remunerativeness, inoculation with smallpox no longer required the combined services of a physician, a surgeon and an apothecary; it had become a matter of simple routine, just as ill paid (or as well paid, according to circumstances) as inoculation with the matter from the cow. It was not on such grounds, but on grounds of scientific principle or of sentimental interest, that an active propaganda was kept up in favour of the old inoculation. The leading defenders of the latter, such as Moseley, physician to Chelsea Hospital, and Birch, surgeon to St Thomas's Hospital, maintained that cowpox was alien in nature to smallpox and could not be received as its equivalent. The foreign protagonists, such as Dr Müller, of Frankfort, and Dr Verdier, of Paris, emphasized still more the radical unlikeness of cowpox to smallpox. Said Verdier: "The vaccinists appeal to experience, setting aside all objections based upon the unlikeness of cowpox to smallpox. We are to be made invulnerable by vaccine as Achilles was made invulnerable by being dipped in the waters of the Styx. Protection by cowpox contradicts the received principle of inoculation. It is in vain to appeal to experience against established principles: for true principles are the result of the experience of all ages, and become the touchstone of each successive empirical innovation."

The English inoculators by the old method gave all sorts of reasons for their preference, and were doubtless actuated by the usual mixture of motives. There were medical families, such as the Lipscombs, who had an hereditary interest and pride in inoculation. It was a Lipscomb who had recited in the Sheldonian Theatre during the Oxford commemoration of 1772,

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Physicians on Vaccination. 1808, p. 11. Jenner writing to James Moore, 18 Nov. 1812 (in Baron, II. 383), enumerates his various grievances against Pearson, "and finally, finding all tricking useless, his insinuations that vaccination is good for nothing."

[1] The equality of the two methods in this respect comes out incidentally in two reports of the Whitehaven Dispensary. In the report for 1796, when smallpox matter was in use, it is said that "173 were inoculated, all of whom, soliciting little medical assistance, recovered." In 1801, when cowpox matter had been substituted in every case, the same phrase is used: "We seldom find any medical assistance required in this disease."

a poem, "On the Beneficial Effects of Inoculation." Inoculators to the third generation, it was not surprising that the Lipscomb family should have caused to be printed in 1807, as if to shame the changing fashion of the day, the prize poem of five-and-thirty years before, which contained such spirited lines as these:

"When, pierced with grief at sad Britannia's woes,
Her country's guardian Montagu arose:
Pure patriot zeal her ev'ry thought inspir'd,
Glow'd on her cheek, and all her bosom fir'd.
She saw the Tyrant rage without controul,
While just revenge inflam'd her gen'rous soul.
Full well she knew, when beauty's charms decay'd,
Britannia's drooping laurels soon would fade:
Pierc'd with deep anguish at the afflictive thought
And whelm'd with shame, a heav'n-taught Nymph she sought,
Whose potent arm, with wondrous power endued,
Had oft on Turkey's plains the fiend subdued.
Obedient to her prayer the willing Maid
In pity came to sad Britannia's aid.
'Henceforth, fall'n Tyrant!' cries the Nymph, 'no more
Hope that just Heav'n will thy lost pow'r restore:
Let now no more thy touch profane defile
The sacred beauties of Britannia's isle.
By me protected shall they now deride
Thy baffled fury and thy vanquish'd pride[1].'"

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[1] *The Beneficial Effects of Inoculation.* Oxford University Prize Poem. Oxford, 1807. It seems probable that this was the "Oxford copy of verses on the two Suttons" that Coleridge (*Biographia Literaria* (1817), Pickering's ed. II. 89) professed to quote from in the following passage; at least it would be remarkable if there had been printed another Oxford poem on the same subject and in the same manner: "As little difficulty do we find in excluding from the honours of unaffected warmth and elevation the madness prepense of pseudopoesy, or the startling hysteric of weakness over-exerting itself, which bursts on the unprepared reader in sundry odes and apostrophes to abstract terms. Such are the Odes to Jealousy, to Hope, to Oblivion, and the like, in Dodsley's collection and the magazines of the day, which seldom fail to remind me of an Oxford copy of verses on the two Suttons, commencing with

'Inoculation, heavenly maid! descend!'"

It appears that Coleridge himself contemplated a poem on Cowpox Inoculation, which was to have exemplified what poetry should be, just as the 18th century Oxford poem on Smallpox Inoculation exemplified what poetry should not be. It was clearly more than the difference 'twixt tweedle-dum and tweedle-dee. Writing to Dr Jenner on 27 Sept. 1811, from 7, Portland-place, Hammersmith, he said: "Dear Sir, I take the liberty of intruding on your time, first, to ask you where and in what publication I shall find the best and fullest history of the vaccine matter as the preventive of the smallpox. I mean the year in which the thought first suggested itself to you (and surely no honest heart would suspect me of the baseness of flattery if I had said, inspired into you by the All-preserver, as a counterpoise to the crushing weight of this unexampled war), and the progress of its realization to the present day. My motives are twofold: first and principally, the time is now come when the 'Courier'...is open and prepared for a series of essays on this subject; and the only painful thought that will mingle with the pleasure with which I shall write them is, that it should be at this day, and in this the native country of the discoverer and the discovery, be even *expedient* to write at all on the subject. My second motive is more selfish. I have planned a poem on this theme, which after long

Still it was just among those classes to whom the *argumentum ad nitorem* came home most forcibly that the fashion had changed. Before the end of the 18th century, the danger to beauty from an attack of smallpox had become a matter chiefly of historical interest, carrying the mind back to the Restoration or the early Georgian era. The richer classes, while they seem to have countenanced cowpox inoculation as a good thing in general, were probably apathetic on their own account. Lord Mulgrave said in the House of Lords on 8 July, 1814; "If their lordships recollected how many persons of the higher order were reluctant to introduce vaccination into their families, it really must appear to them a harsh and arbitrary measure to lay the poor under the necessity of adopting the practice." The working class had been manifesting a devotion to the old practice which, indeed, they had never shown so long as it was unchallenged. Perhaps one reason to account for the undoubted preference of the poorer classes for the old inoculation was that they had only lately taken to it. Another was that a good deal of inoculation was done by amateurs of their own class—blacksmiths, farriers, tradesmen and women. A third reason was that the poorer classes, among whom smallpox prevailed most, saw their children take smallpox all the same, and cared little for the scientific explanation that a false or spurious kind of cowpox matter had been used. In October, 1805, a correspondent wrote from London to an Edinburgh journal: "The many late failures of supposed cowpock to prevent the smallpox have excited in some parts so much clamour among the lower orders of people that they insist upon being inoculated for the smallpox at some of the public institutions[1]." A report on vaccination made to Parliament by the College of Physicians in 1807, deplores "the inconsiderate manner in which great numbers of persons ever since the introduction of vaccination are still every year inoculated with the smallpox." When, in consequence of the same report, a vote was brought forward in Parliament to give Dr Jenner a national reward of twenty thousand pounds in addition to the ten thousand that he had

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deliberation, I have convinced myself is capable in the highest degree of being poetically treated, according to our divine bard's [Milton's] own definition of poetry, as '*simple, sensuous*, (i.e. appealing to the senses by imagery, sweetness of sound, &c.) and *impassioned, &c.*'" *The Life of Edward Jenner, M.D.* By John Baron, M.D. 2 vols. II. 175.

[1] *Edin. Med. and Surg. Journ.* I. 507.

got five years before, the populace were so angry that one of their leaders, John Gale Jones, himself a medical man, sent a message to Jenner at his lodgings in Bedford Place to advise him "immediately to quit London, for there was no knowing what an enraged populace might do[1]."

Few particulars remain of the old inoculation at this time. One fact significant of the impression that the criticisms of cowpox had made is that Dr John Walker, director of the Royal Jennerian Society, who pushed "vaccination" among the poorer classes more than anyone in London, was all the while an inoculator in the old manner. He wrote to Lettsom, "I have from the first introduction of vaccination entertained an opinion respecting its nature different from those who suppose it a *substitute* only for smallpox....I have, from an early part of my practice, been in the habit of *diluting* smallpox virus with water previous to its introduction into the system;" and this he had been doing in the name of Jenner, under the influence of a belief that, if cowpox were not smallpox, it ought to be, that it was a pity the disease had ever been called cowpox, and that the name (which was a very old one) "has only served to debase it in the eyes of the common people, and prevent its general adoption[2]." The very director of the Jennerian institute was among the prophets of the old inoculation.

With the revival of smallpox in general epidemic diffusion in 1816–19 we begin to hear more of the old inoculation. The account already cited of the outbreak at Ulverston contains a table of fourteen previously cowpoxed children whom it was thought desirable during the epidemic to inoculate with smallpox, all of them receiving the infection in one degree or another. A practitioner at Dunse, Berwickshire, not only returned to the old inoculation (thereby incurring "much odium," as he believed), but actually took his matter from the natural smallpox of his cowpox failures[3].

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[1] Jenner to James Moore, 26 Feb. 1810, in Baron, II. 367.

[2] Walker to Lettsom, 1 Sept. 1813, in Pettigrew's *Memoirs of Lettsom.* Lond. 1817, III. 350.

[3] Dr Smith to Dr Monro, Dunse, 2 June, 1818, in Monro's *Obs. on the different kinds of Smallpox*, 1818. There appears to have been some reluctance to face the facts. "Though I have seen," says Smith, "a multitude of cases in which smallpox has in every possible shape taken place after vaccination, I feel myself placed in the painful situation [why painful ?] of bringing forward many facts to which gentlemen of the first eminence in the profession will probably give little or no credit."

When the epidemic reached the Eastern Counties, there were demands for the old kind of inoculation, not in Norwich only, but in numerous country parishes. Of ninety-one surgeons in Norfolk and Suffolk, who answered the queries of Cross, thirty-eight had practised the inoculation of smallpox in the epidemic of 1819; five of them, after having refused many private applications for inoculation in the old way, had at length yielded to the desire of the Overseers of the Poor, and had inoculated whole parishes. Cross's correspondents also testified that there was much inoculation going on at that time in the Eastern Counties by the hands of farriers, blacksmiths, tailors, shoemakers and women.

Dr John Forbes, who then practised at Chichester, brought to light an exactly similar state of public feeling in Sussex in 1821–22[1]. In the parish of Bosham there lived a farmer named Pearce who had an inherited skill in inoculating, his father having inserted smallpox into ten thousand persons in his day, without killing one of them. Pearce offered to wager with Forbes a considerable sum that he would inoculate any number of persons and that none of them should have more than twenty pustules. He believed that the smallpox matter became "as weak as water" by an uninterrupted transmission from one body to another.

In November, 1821, the Overseers of the Poor employed him to inoculate the pauper children, and his skill was soon in request for others, so that from two to three hundred in the parish were inoculated by him within a short time. He charged half-a-crown or a crown for each. From other parishes the people flocked to him in such numbers that he inoculated upwards of a thousand in the winter and spring of 1821–22. Before long he had three itinerant rivals, a knifegrinder, a tinsmith and a fishmonger, who claimed to have inoculated together a thousand persons, including four hundred previously cowpoxed. The surgeons of Emsworthy and Havant at length joined in the business, and in the space of six or eight weeks inoculated from twelve to thirteen hundred persons, who had not been previously vaccinated. Forbes also received from his medical friends in and around Chichester "an account of 680 cases of previously vaccinated individuals subjected by them to variolous inoculation." In the great majority of these the

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[1] *Lond. Med. Repository.* Sept. 1822.

constitutional symptoms were so slight as to be only just observable, the eruption consisting of only a few pustules, which were all that the Pearces, of Bosham, father and son, ever expected to get with inoculated smallpox where no infection of cowpox had preceded. Disappointments with the new inoculation had led to a great revival of the old also at Canterbury, the operators being mostly women.

The same thing happened in Cambridgeshire and in Bucks. In a parish within eleven miles of Cambridge several hundred persons were inoculated with smallpox in 1824, and in April, 1825, a medical practitioner inoculated a number in a village near[1]. During a severe epidemic in the parish of Great Missenden, Bucks, which followed a general vaccination, and caused a prejudice against the latter, the old inoculation was generally resorted to[2]. It looked for a brief period, about the time of the epidemic of 1824–26, as if the old inoculation were to return to favour even with the profession itself. Dr John Forbes wrote of the two kinds of inoculation in a studiously impartial manner. Dr Robert Ferguson, who was also destined to make a name, addressed in 1825 a letter to Sir Henry Halford in which he advocated a singular compromise, namely, two inoculations, one with cowpox, the other with smallpox, the cowpox to neutralize the contagiousness of the smallpox for the occasion, while the latter was to be the prophylactic against itself for the future[3]. This reaction, if it deserves that name, corresponds in time to the great decline in the number of gratuitous vaccinations at Manchester, a decline which had been equally remarkable at Glasgow for some years before. There was at least an apathetic spirit towards cowpox inoculation during the epidemic of 1817–19, and for a good many years after

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[1] J. J. Cribb, *Smallpox and Cowpox.* Cambridge, 1825.

[2] *Ibid.* Letter of Rev. R. Marks, of Great Missenden, 6 May, 1824: "The summer I came here the smallpox was introduced, and as the weather was very hot, and the confluent sort was what appeared, the people began to die almost as fast as they took the plague. Great prejudice prevailed against vaccination, in consequence of the parish having some years ago been vaccinated by a gentleman who knew nothing of the matter, and contaminated the people with decomposed virus, when it was good for nothing but to make ulcers and produced very wretched arms, and left them all liable to smallpox, which they were all inoculated for the same year." This clergyman subsequently vaccinated 500 cases, and the parish surgeon 300: "and here," says the former, "I had the happiness of seeing the plague and destruction of a most horrid smallpox completely stopped."

[3] Robert Ferguson, M.D. *A Letter to Sir Henry Halford, proposing a method of Inoculating the Smallpox, which deprives it of all its Danger, but preserves all it Power of Preventing a Second Attack.* London, 1825.

it, while there was something like toleration, even among medical men, for the old inoculation.

The Smallpox Epidemic of 1825–26.

Compared with the epidemic of 1837–40, which was the first in England to be recorded under the new system of registration of the causes of death, the smallpox of 1825–26 makes a poor figure in the records. Yet there is reason to believe that it was an epidemic of the same general kind, if not of the same duration or fatality. At the Newcastle Dispensary far more children in the smallpox were visited in 1825 than in any year since its opening in 1777, namely, 113 cases, with 28 deaths, which would have been a small fraction of all the cases in Newcastle. At the Rusholme Road Cemetery, Manchester, which received about a fourth part of the burials, 112 children, all under seven years, were buried from smallpox in the six months, 18 June to 18 December, 1826[1]. At Bury St Edmunds smallpox began to be epidemic about the end of 1824, when the guardians ordered a general vaccination, and reached its worst in July, 1825, the type being confluent in many of the cases[2]. It was in Cambridgeshire villages the same year, and is casually heard of in Bucks[3]. It had been severe at Oxford and Canterbury in 1824. At Glasgow the prevalence of fever is known for the corresponding years, but the smallpox deaths have not been taken out of the burial registers. The evidence from London is perhaps the best indication that the smallpox of 1825 was one of the more severe periodic visitations.

The extensive prevalence of smallpox was heard of in Paris before the epidemic attracted much notice in London; the news of persons of distinction dying by smallpox in the French capital reads like the old notices of it in 17th century letters. In the same year it was very severe also in Sweden after a long period of quiescence. As to London, Dr George Gregory, physician to the Smallpox Hospital, said[4]: "It may be inferred

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[1] John Roberton, *Observations on the Mortality and Physical Management of Children.* London, 1827, p. 59, *note.*

[2] J. Dalton, "Smallpox as it prevailed at Bury St Edmunds in 1825." *Lond. Med. and Phys. Journ.* May, 1827, p. 406.

[3] Cribb, u. s.

[4] "Observation on Smallpox as it has occurred in London in 1825." *Med. and Phys. Journ.* Feb. 1826, p. 117.

that smallpox has been nearly as general in 1825 as in any of the three great epidemics of the preceding century"—the demand for admission to the Hospital being, in his opinion, a fair index; while private information confirmed the estimate of its truly epidemic prevalence, and of its incidence chiefly upon the lower classes[1]. In the years of the 18th century to which he referred, and in four maximum years of the 19th century, the cases and deaths at the Smallpox Hospital had been as follows[2]:

London Smallpox Hospital.

Year	Cases	Deaths	Year	Cases	Deaths
1777	497	125	1819	193	61
1781	646	257	1822	194	57
1796	447	148	1825	419	120
1805	280	97			

While the demands upon the beds of the hospital pointed, as Gregory supposed, to the existence of a great epidemic in London, comparable to those of 1777, 1781 or 1796, in which years the smallpox deaths were returned by the parish clerks at 2567, 3500 and 3548 respectively, yet in 1825 the bills showed only 1299 deaths from smallpox. Gregory accepted without demur the figures of the parish clerks' bills in 1825, although it is well known that they had become more and more defective, even for the original parishes, since the end of the 18th century[3]. "But for the general prevalence of vaccination," he said, the smallpox deaths in 1825 would have been 4000 in the same number of attacks, the difference being in the rate of fatality. His conclusion for all London was based upon the experience of the Smallpox Hospital. The patients received by that charity were of the same class as formerly, most of them being adults, among whom the proportion of fatalities was greater than at all ages. Taking the three epidemics of the 18th century with which he compared the epidemic of 1825 in respect of extent or number of attacks, we find that 25 per cent. of the cases admitted died in

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[1] *Med. and Phys. Journ.* 1826, p. 122. "The general voice of the public satisfactorily showed that the upper ranks of society suffered during the past year from smallpox much less than the lower."

[2] Gregory, *Report on the Smallpox Hospital*, 4 Dec. 1825.

[3] Farr, in the First Report of the Registrar-General (1839, p. 100), said: "It may be safely asserted that the parish clerks registered little more than half the deaths that occurred within the limits of the London bills of mortality." Outside the limits of the bills there were large parishes, such as St Pancras, Marylebone, Kensington and Chelsea, which had large mortalities from smallpox in the first years of registration.

1777, 39 per cent. in 1781 (the seasons were unwholesome by epidemic agues, dysenteries, and typhus), and 33 per cent. in 1796. The average of fatalities at the hospital from its opening in 1746 to the end of the century was about 29 per cent., and that was exactly the ratio of deaths among the 419 patients in 1825. The rate of fatality was a little higher than in the epidemic of 1777, and a little lower than in each of the epidemics of 1781 and 1796. Gregory in 1825 was enabled to separate the sheep from the goats by the dividing line of cowpox, the former dying at the rate of 8 per cent., the latter at the rate of 41 per cent. There are various ways of apportioning a general average. The presence or absence of cowpox scars is one principle, which could not have been used to break up the 25 per cent of 1777, or the 39 per cent. of 1781, or the 33 per cent. of 1796, into two component parts. One thing common to all times is the different rate of fatality at different ages. All the deaths in the 8 per cent. division of 1825 were between the ages of eighteen and twenty-seven; the ages of the 41 per cent. division are written in the books of the hospital. In portioning out the general rate of fatality from typhus fever at the London Fever Hospital, it is found that the dividing line of age is nearly the same as the dividing line of social position; in one table the high ratio of deaths to attacks is among persons in the second half of life, and the low ratio among persons in the flower of their age; in another table the many deaths to cases are among paupers, and the few fatalities among paying patients[1]. However manifold the cutting up of a general average, some divisions would be identical, corresponding to natural lines of cleavage.

Having indicated the chief points in the vaccination controversy by the instance of Gregory's arguments sixty years since, (to which might have been added the question of efficient or inefficient vaccination according to the appearance of the scars in after life[2]), I shall for the rest depart from the usual practice of interlocking the history of smallpox epidemics with the history of vaccination. I shall treat the latter as *ex hypothesi*

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[1] Tables in Murchison's *Continued Fevers of Great Britain.*

[2] *Med. Chir. Trans.* XXIV. 15. His other papers are: "Cursory Remarks on Smallpox as it occurs subsequent to Vaccination," *ibid.* XII. 324; and "Notices of the Occurrences at the Smallpox Hospital during the year 1838," *ibid.* XXII. 95. He contributed the treatise on Smallpox to Tweedie's *Library of Medicine*, I. 1840, and indicated his final opinions (which are interesting) in his *Lectures on the Eruptive Fevers*, 1843.

irrelevant, leaving it to each reader to incorporate, as matter of his own familiar knowledge or belief, whatever effects of cowpox upon smallpox, whether temporary effects or permanent, modifying effects or absolutely prophylactic, may suit his particular creed. I am led to take this course for several reasons. It leaves me free to look at the epidemics of smallpox from the same point of view as the other epidemics treated of in this work. It avoids a controversy which, unlike that of inoculation, is still actual, and unsuited to a historical treatise. It enables me to omit the excuses for failure, which are apt to be interminable and to usurp the whole space available for the epidemiology proper. Lastly, the irrelevancy which I here conveniently assume happens to be my real belief,—as elsewhere set forth in an examination of the antecedent probability arising out of the pathological nature and affinities of cowpox, and in a study of the grounds on which the authority of the profession was originally given to Dr Jenner's teaching.

The interval between the epidemic of 1825 and that of 1837–39 was occupied by a good deal of smallpox steadily from year to year in London, the deaths from which, in the following table from the bills of mortality, are to be understood as only a part of the whole, according to the explanation already given:

Year	Smallpox deaths	Year	Smallpox deaths	Year	Smallpox deaths
1826	503	1830	627	1834	334
1827	616	1831	563	1835	863
1828	598	1832	771	1836	536
1829	736	1833	574	1837	217

The inadequacy of these returns will appear from the fact that the 217 deaths in 1837 rose, under the new system of registration, from 1 July to 31 December, to 762, or to fully three times as many for the last six months as the parish clerks returned for the whole year. Their bills had become most defective when they were about to be, or had been superseded; but even on the special occasion of the cholera in 1832 they returned only some three-fifths of the known deaths. Besides these London figures there is little to show the extent of smallpox in England between the epidemic of 1825 and that of 1837–39. This was the time when many complaints were made of the so-called loss of power or strength in the current cowpox matter for inoculation. These complaints appear to have arisen

from the greater frequency of smallpox among the cowpoxed, corresponding to the increasing numbers of the whole population who had received that kind of inoculation. "Secondary smallpox," says a report from Worcestershire in 1833, "has been very prevalent of late years[1]," the term "secondary" reflecting the teaching of Baron, chairman of the Smallpox Committee of the Medical Association, that cowpox itself was the primary smallpox. The increasing number of the vaccinated who took smallpox was clearly shown in the returns from the Smallpox Hospital of London, and was believed to be in proportion to the increasing number of the rising generation who had been vaccinated[2].

A generation of Smallpox in Glasgow.

Glasgow had afforded the most striking instance in Britain of the decline of smallpox after the beginning of the 19th century. The decline was observed everywhere, but it was most noticeable in Glasgow, partly because the smallpox mortality of infants at the end of the 18th century had been excessive there, partly because Dr Watt took the trouble to prove it statistically from the burial registers. In the last six years of the 18th century, 1795–1800, smallpox had contributed 18·7 per cent. of the deaths from all causes; from 1801 to 1806, it contributed 8·9 per cent., and from 1807 to 1812 only 3·9 per cent. In the next six years, 1813–19, if Cleland's search of the registers has been as laborious as Watt's, the share of smallpox was only 1·07 per cent. of the deaths from all causes, which would mean that Glasgow was hardly at all touched by the epidemic of 1817–19, reported from many other parts of Scotland[3]. But the lull in

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[1] Kenrick Watson, "Medical Topography of Stourport and Kidderminster." *Trans. Prov. Med. and Surg. Assoc.* II. 195.

[2] John Roberton, "On the Increasing Prevalence of Smallpox after Vaccination." *Lond. Med. Gaz.* 9 Feb. 1839, p. 711. Roberton had been a warm supporter of the Jennerian method from as early a date as 1808, when he was resident in Edinburgh, and again in his book on *The Mortality of Children*, in 1827. The above cited paper is somewhat satirical, the disappointing facts of it being referred to the Island of Barataria. His conclusions are (p. 713): (1) "It is not fact, but conjecture, that the protective power of cowpox gradually ceases in the human system. (2) It is not fact, but conjecture, that a person successfully re-vaccinated is less liable to smallpox than he was before. (3) To affirm that, when re-vaccination fails in individuals, they are thereby proven to be secure from smallpox, is conjecture."

[3] Cowan, "On the Mortality of Children in Glasgow," *Glas. Med. Journ.* V. (1831), p. 358, does not give Cleland's figures, but says: "No bills of mortality except those for the Royalty in the *Glasgow Courier* are in existence for the period from 1812 to 1821"; and again: "Finding that the suburbs were excluded, and the Calton being the burying-place in which the greatest number of children are interred,

smallpox, which corresponded on the whole to the still greater lull in fevers during the prosperous times of the second half of the French war, was broken in Glasgow, if not in 1817, yet before long. Unfortunately there is a break in the statistics also. From 1821 the magistrates caused annual bills of mortality to be published, which did not, however, specify the causes of death until 1835[1]. But we have some intermediate glimpses of the state of the poorer classes and of the prevalence of smallpox in particular. Writing in 1827, Dr Mac Farlane one of the poor's surgeons, remarks upon the feeble stamina, sallow complexions, and the like, of all but a few children in the more crowded parts, adding that smallpox both in the virulent and "modified" forms had been more prevalent during the last three or four years than formerly[2]. Three years after, Drs Andrew Buchanan and Weir gave an account of the state of the poor in Glasgow, which shows that it had actually deteriorated with the growth of the city. The poorer classes had been in some part displaced from their old dwellings in the heart of the town owing to the building of warehouses or the like, and had been provided with no new habitations as good as the old. "Apartments originally intended for cellars, and occupied as such until lately, are now inhabited by large families, and the only opening for light and air is the door, which when shut encloses the poor creatures in a tainted atmosphere and in total darkness. This is well exemplified in the cellars belonging to the houses on the south side of St Andrew's Street." Not only the notorious region of the Wynds, containing part of the three parishes of the Tron, St Enoch's and St James's, but also the Saltmarket and Gallowgate, were crowded with a destitute, vagrant and often vicious class of people. Many of the houses in the Wynds, with their network of alleys, were only one or two storeys high, in the old Scotch fashion; here were the night lodging-houses, with several beds in one room, two or three persons in a bed, twelve to eighteen people in as many square

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I thought it needless to insert any tabular view of the deaths by measles since the date of Dr Watt's tables." Watt could have made no tables if he had not gone direct to the sixteen MS. volumes of burial registers, including those of the Calton.

[1] J. C. Steele, *Glas. Med. Journ.* N. S. I. 60: "From 1812 to 1835 it is much to be regretted that no record of the deaths from smallpox has been kept for even a limited period."

[2] *Glas. Med. Journ.* I. 105: "There exists at present among the poorer classes an increasing carelessness and aversion to vaccination, from a belief that it does not afford adequate protection from the varioloid disease."

feet: "the extreme misery of these poor people is utterly inconceivable but to those who have actually witnessed it; it has certainly been carried to the very utmost point at which the existence of human beings is capable of being maintained. Some of them are lodged in places where no man of ordinary humanity would put a cow or a horse, and where those animals would not long remain with impunity." Buchanan found sometimes a horse, sometimes an ass, sometimes pigs, in the same dungeon with one or more families[1]. Such was the region in which Chalmers ministered from 1815 to 1822, first in the Tron parish, afterwards in the poor and crowded parish of St John's. Things got no better, certainly, after he left worn out by his exertions, to become professor at St Andrews. Buchanan thought the best index of the degradation of the people in 1830 to be that not one in ten ever entered a church (if they had, he explains, the respectable congregation would have fled from their filth and rags). "The people are starving," he exclaims, "and there is a law against the importation of food[2]." It took sixteen years longer to secure the benefits of free trade, and meanwhile the public health of Glasgow got worse rather than better. The infantile part of it attracted far less notice than that which touched adults, so that we hear little of smallpox, while the records of fever and cholera are fairly complete. When the curtain is lifted in 1835 by the publication of statistics, the mortality of infants and children by infectious diseases is found to be proceeding as follows:

Glasgow Mortalities, 1835-39.

Year	Deaths from all causes	Deaths from smallpox	Deaths from measles	Deaths from scarlatina
1835	7198	473	426	273
1836	8441	577	518	355
1837	10270	351	350	79
1838	6932	388	405	87
1839	7525	406	783	262

According to the following table of the ages at death from smallpox, it will appear that a higher ratio of infants died of it

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[1] Andrew Buchanan, M.D. "Present Condition of the Poor in Glasgow." *Glasg. Med. Journ.* III. (1830), 437.

[2] Chalmers had been urging the repeal of the Corn Law since 1819. In a letter to Wilberforce, Glasgow, 15 Dec. 1819, he says: "From my extensive mingling with the people, I am quite confident in affirming the power of another expedient to be such that it would operate with all the quickness and effect of a charm in lulling their agitated spirits—I mean the repeal of the Corn Bill." Hanna's *Memoirs of Dr Chalmers*, 1850, II. 250.

in their first year at Glasgow than was the rule elsewhere, whether in the 18th or in the 19th century. It was only in the year 1837, when typhus was at its worst and smallpox had somewhat declined, that the deaths by the latter of infants under one year were fewer than those of infants in their second year:

Glasgow: Table of Deaths from Smallpox 1835 *to* 1839.

	Under 1	1—2	2—5	5—10	10—20	20—30	30—40	Above 40	Total
1835	204	154	75	17	14	8	1	0	473
1836	202	174	144	23	6	24	2	2	577
1837	93	116	94	24	10	11	4	0	352
1838	111	99	119	28	11	14	4	2	388
1839	137	98	113	19	15	17	5	2	406
Totals of five years	747	641	545	111	56	74	16	6	2196
Percentages	34%	29%	25%	5%	7%				

Cowan, who published these figures in 1840, had written eight years before, "I fear that if the list of infantile diseases were still published in the mortality bills many deaths from smallpox would annually be found." We do, indeed, hear of epidemics of smallpox not far from Glasgow. At Stranraer, in Sept.–Nov. 1829, "measles and smallpox attacked with scarcely an exception" all the children in the place who had not acquired immunity either by previous attacks or by the influence of vaccination; "and even these powerful protectives were, in many instances, of no avail." The subjects of "unmodified" smallpox were nearly all infants of the poorer class. In St John's Street, occupied by decent Scots labouring people, ten children had "unmodified" smallpox and all recovered; in Little Dublin Street, so called from its Irish tenants, fourteen children had smallpox, of whom six died[1]. At Ayr, about the same time, there was an epidemic, which came to a height in 1830, causing a considerable mortality[2]. At Edinburgh in the winter of 1830–31, it was unusually prevalent and fatal, the epidemic dying out in May, 1831[3].

For three or four years, 1843–46, there was another lull in the prevalence of smallpox in Glasgow; but the mortality rose again, reaching in the two years 1851 and 1852 the total of

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[1] J. Orgill, "Obs. on the Measles and Smallpox that prevailed epidemically in Stranraer, in the autumn of 1829." *Glasg. Med. Journ.* IV. 351.

[2] Mc Derment, *ibid.* IV. 201.

[3] Howison, *ibid.* V. 256–7.

1202, in a population of 360,138, which contrasted with the 2212 deaths in London in the same two years, and with the Paris mortality of 706 in the two years 1850 and 1851, in a population of about one million, the deaths being still almost wholly infantile in Glasgow while they were in great part of adults in Paris[1].

Glasgow Smallpox.

Year	Smallpox deaths	Year	Smallpox deaths
1840	455	1847	592
1841 (pop. 282, 134)	347	1848	300
1842	334	1849	366
1843	151	1850	456
1844	99	1851 (pop. 360, 138)	618
1845	195	1852	584
1846	not recorded		

Registration of the causes of death began in Scotland in 1855. In the first decennial period, to 1864, the smallpox deaths were 10,548, falling upon infancy and other age-periods as in the following table[2]:

Age-periods	Smallpox deaths
Under three months	774
Three to six months	668
Six to twelve months	1543
One to two years	1765
Two to three years	1132
Three to four years	798
Four to five years	514
Total under five years	7194
Above five years	3354
	10,548

Smallpox in Ireland, 1830–40.

Before coming to the epidemic in England let us glance at the prevalence of smallpox at this period in Ireland. Dr Cowan, of Glasgow, was struck by the fact that among ninety patients in the Infirmary with smallpox, all adults, only four

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[1] J. C. Steele, *Glasg. Med. Journ.* N.S. I. 59.

[2] *Eleventh detailed Report of the Regr.-Genl. for Scotland*, 1865, p. xxxix. The Report says that vaccination was general during the above period, although there was no Vaccination Act for Scotland (until 1864). This was familiar knowledge in Scotland, so much so that the necessity for a compulsory law, on the English model, was not quite obvious in the medical circles of Edinburgh. See Christison's address to the Social Science Association at Edinburgh in 1863 (p. 106). In my own recollection of Aberdeenshire, the vaccination of infants was as little neglected as their baptism; the law made no real difference.

were from the considerable Irish population of the city, t larger number being natives of the Highlands of Scotlar This leads him to say: "The immunity of the Irish from sma pox is owing to the general practice of vaccination among tl lower classes by the surgeons of the county and other dispe saries" (another Glasgow writer ascribes the prevalence of smal pox to the Irish negligence in the same matter). It happer that we can bring one part of this statement to a statistical tes The same volume of the *Journal of the Statistical Societ* which contained the paper on the vital statistics of Glasgov contained also a statistical account of the public health o Limerick, by Dr Daniel Griffin, physician to the Dispensary[1]. Dr Griffin's figures were of the only kind that could then be got for an Irish town, and were representative rather than exhaustive. Struck by the seemingly enormous death-rate of infants in the poorest quarters of Limerick, he sought to bring out the facts with numerical precision. He provided a register-book at the Dispensary, in which he entered the results of his observations and retrospective inquiries among eight hundred families of the poorest class during "a good many years" down to 1840. The city of Limerick, and especially the parish of St Mary, was full of the misery and destitution that characterized Ireland in the years of its greatest over-population. The ejected cottiers and broken small farmers of the neighbouring county flocked to it, living in beggary in wretched lodging-houses with swarms of infants and children, the breadwinners finding only an occasional day's work as labourers. Among 800 such families during the years of his inquiries the chief causes of death among the infants and children were as follows:

Limerick Dispensary Deaths.

	Under Five years	Five to Ten	Above Ten	Total
Convulsions	569	18	7	594
Smallpox	333	55	5	393
Measles	187	32	7	226
Diarrhoea and Dysentery	108	19	24	151
Whooping cough	84	10	1	95
Croup	85	9	1	95
Scarlatina	8	2	0	10
Fever	70	33	66	169

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[1] "An Enquiry into the Mortality among the Poor in the City of Limerick." *Journ. Statist. Soc.* Jan. 1841, III. 316.

The more exact ages at death from smallpox in male and female children were:

	Under One	One and Two	Three and Four	Five to Nine	Above Nine
Males	33	72	37	29	2
Females	52	92	47	26	3
	85	164	84	55	5

As compared with Glasgow, measles at Limerick has a much lower place than smallpox in the infantile mortality, while scarlatina hardly counts at all. Again, only 1·27 per cent. of the smallpox deaths are above the age of nine, whereas at Glasgow 7 per cent. are above the age of ten. Griffin's data for reckoning the probability of life were incomplete, as he was well aware; so that the following comparison of the poor attending Limerick Dispensary with all England and Wales probably errs in making the Irish town somewhat more fatal to infants of the poor than it really was:

	England and Wales in 1000 deaths	Limerick Dispensary in 1000 deaths
Under one year	214·54	327·71
One and under three	128·00	287·67
Three and under five	48·51	128·20
Five and under ten	46·07	97·29
Ten and under fifteen	25·91	24·93
Fifteen and under twenty	34·16	20·37

In a thousand deaths at all ages, 391·05 occurred before the age of five years in England and Wales, but 743·58 before the age of five years among a certain section of the poor of Limerick; and in the latter enormous sacrifice of infant life smallpox was the greatest single means next to convulsions. Perhaps that was the reason why so few of the Irish in Glasgow were attacked by smallpox in adult age. The experience of Limerick was not exceptional in Ireland. In the ten years 1831-40, for which the causes of death were ascertained by means of queries in the census returns of 1841, the total of deaths by smallpox was 58,006, nearly double the mortality by measles (30,735) and seven times that of scarlatina (7,886). It was almost wholly a malady of infants and children, the first and second years of life being its most fatal period. Only 129 of these deaths were returned from hospitals. The bulk of the

decennial smallpox deaths fell in the two years 1837 and 1838, corresponding with the high epidemic mortality in England[1].

The Epidemic of 1837–40 in England.

The smallpox epidemic of 1837–40 was already in full force at Liverpool, Bath and Exeter when the mortality returns began to be made on 1st July, 1837, under the new Registration Act. Whether or not the contagion travelled from Ireland or the west of Scotland, the epidemic in England began in the west and south-west, and reached the Eastern counties last. The following table shows its rise and progress at selected places in the several quarters, beginning with the third quarter (July--September) of 1837[2]:

	1837		1838				1839			
	3rd qr	4th qr	1st qr	2nd qr	3rd qr	4th qr	1st qr	2nd qr	3rd qr	4th qr
Liverpool	375	132	32	24	18	36	11	29	75	138
Bath	154	18	15	1	1	2	1	25	17	30
Exeter	88	131	6	—	2	—	—	—	—	—
Bristol	21	74	72	44	4	7	6	—	—	—
Clifton	16	32	49	27	7	—	—	—	1	7
London	257	506	753	1145	1061	858	364	117	65	60
Manchester	23	98	127	120	111	180	94	40	33	53
Birmingham	34	55	85	86	66	47	26	12	7	10
Sheffield	14	14	27	36	22	12	9	3	4	—
Leeds	4	11	29	69	134	197	74	55	30	15
Newcastle	16	17	66	11	—	23	54	24	39	25
Abergavenny and Pontypool	13	85	102	50	22	21	22	30	26	10
Merthyr Tydvil	9	54	160	91	10	3	18	16	12	—
Weymouth, Bridport, and Beaminster	4	19	92	31	8	4	10	9	2	—
Plymouth	10	15	11	14	37	48	9	8	1	—
Taunton	—	7	66	40	4	3	—	—	—	—
Leicester	43	5	3	2	3	3	9	21	5	5
Norwich	1	—	—	—	—	17	180	204	10	7
Lynn etc.	—	1	2	10	7	4	127	81	6	—
Ipswich	—	—	2	6	38	95	23	—	1	—
Bury St Edmunds etc.	1	3	30	24	2	3	—	—	—	—
Woodbridge etc.	4	9	27	16	5	11	10	2	—	4

The epidemic having begun in the west and south-west in the summer of 1837, spread in the winter of 1837–38, all through the hills and valleys of Wales, causing high mortalities around

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[1] *The Census of Ireland*, 1841. Parl. Papers, 1843. Report on the Tables of Deaths, by W. R. Wilde.

[2] From the Second Report of the Registrar-General, Lond. 1840, p. 180.

Abergavenny, Pontypool, Merthyr Tydvil and other towns in the first quarter of 1838, as well as in the rural parishes. It was not until the end of 1838 that the contagion spread widely over the Eastern counties. The epidemic in Norwich was again short and sharp, like that of 1819, most of the 418 deaths falling within six months of winter and spring, just as most of the 530 deaths in 1819 fell within six months of summer and autumn. The population in 1821 was 50,288, and in 1841, 62,344; the increase was only 1228 between 1831 and 1841, so that the smallpox of 1839 fell upon a stationary population, whereas that of 1819 had fallen upon a rapidly increasing one. In the autumn of 1839 and throughout 1840, a second outburst of smallpox took place in the towns where the epidemic had started two years before, namely, Liverpool, Bath, Bristol, Clifton, etc[1].

But the smallpox of 1840, which produced more deaths than that of 1839, was mostly centred in the Lancashire manufacturing towns, where also the mortality from scarlet fever was enormous. The circumstances of the working class in Lancashire at this time have been described in the chapter on fevers. The following shows the large proportion of smallpox deaths that fell in 1840 to the North-Western or Lancashire registration division.

Smallpox Deaths, 1840.

	1st qr	2nd qr	3rd qr	4th qr
England and Wales	2071	2476	2274	3613
Of which in the N.-W. Division (Lancashire)	1046	986	533	590

The epidemic continued in the manufacturing towns into 1841; in the more rural registration divisions of England it had almost ceased in 1839. From the 1st July, 1837 (beginning of registration) until the 31st December, 1840, the epidemic smallpox in England and Wales caused 41,644 deaths. In 1838 it eclipsed both measles and scarlatina as a cause of death among children; but in 1840 scarlatina gained the leading place and kept it.

1840.

	1st qr.	2nd qr.	3rd qr.	4th qr.
[1] Liverpool	172	184	90	85
Bath	25	42	22	8
Exeter	—	—	1	1
Bristol	6	54	49	76
Clifton	11	28	22	42

Legislation for Smallpox after the Epidemic of 1837–40.

The epidemic of smallpox in 1837–40, which was fatal chiefly to infants and young children, was one of the greatest, like the corresponding epidemic of typhus among adults, in the whole history of England. The troubles of the working class had been more or less chronic ever since the booming times of the Peninsular War had come to an end; the climax was reached in the thirties; the enormous sums spent upon railway construction gave a relief in the forties; and the permanent cheapening of food by Free Trade made an entirely new era, which became visible in the public health after the contagion of the Irish famine had ceased in 1848. The great and hitherto permanent decrease of typhus was brought about by social and economic causes. There, at least, *laissez faire* was all powerful: "Let us be saved," said Burke, "from too much wisdom of our own, and we shall do tolerably well." But there has been at no time since the 18th century the same passiveness towards smallpox; that is a disease against which we must always be doing something direct and pointed. The legislation against smallpox began in England (nothing was done for Ireland and Scotland until long after) with the Act of 1840.

It is a singular instance of the changes in medical opinion and of the vicissitudes of things that the first statute against smallpox should have been instigated by a desire to suppress the old inoculation. Parliament was first moved to action by the Medical Society of London through a petition presented by Lord Lansdowne; but things had been moving that way for some time before in the councils of the British (then the Provincial) Medical Association, under the influence of Dr Baron, the executor and biographer of Dr Edward Jenner. The Bill of 1840 was brought into the House of Lords by the second Lord Ellenborough, and conducted through the Commons by Sir James Graham, who was not then in office. It purposed to enable the poorer classes to get their children vaccinated, if they so desired, at the cost of the ratepayers, and to prohibit under penalties the practice of the old inoculation by amateurs or empirics. Blomfield, bishop of London, said in the Lords' debate that many of the ignorant poor, in agricultural districts, were strongly prejudiced against inoculation with cowpox, and

that they paid much greater attention to empirics, meaning inoculators by the old method, than to the advice of the clergy. In the Commons, Mr Wakley, who was a Radical and the proprietor of one of the weekly medical journals, declared that "no one could be ignorant that the working classes entertained great prejudices against vaccination," although he did not explain why they were prejudiced. According to this medical authority, whom the House took seriously on that subject if on no other, the epidemic of smallpox which the country had just passed through had been in effect due to the contagiousness of the smallpox matter used in inoculating; and he succeeded in carrying an amendment to put down the old practice, not only in the hands of amateurs but also in those of medical men. The eighth clause of the Act decreed that any person convicted before two justices in Quarter Sessions of having wilfully procured the smallpox by inoculation shall be liable to a penalty of imprisonment for a term not exceeding one calendar month. The penal clause against the original inoculation was an indirect compliment to its vitality. Lord Lansdowne also paid it a compliment by recognizing the correctness of its principle; the rival inoculation-matter of cowpox, he said, was "perfectly identical" with smallpox, "although the symptoms were different." This will be a convenient point in the history at which to review the rise and progress of the idea that the inoculation of smallpox was a wilful spreading of contagion and therefore a public nuisance.

The risk of spreading the contagion of smallpox by inoculating the disease was one of the objections to the practice raised by Wagstaffe in his letter to Dr Freind in 1722: "I have considered," he says, "how destructive it may prove to spread a distemper that is contagious." Still more explicit was Dr Douglass of Boston, New England, writing on 1 May, 1722: "I oppose this novel and dubious practice...in that I reckon it a sin against society to propagate infection by this means, and bring on my neighbour a distemper which might prove fatal, and which, perhaps, he might escape (as many have done) in the ordinary way. ..However, many of our clergy have got into it, and they scorn to retract[1]." Within a few months there was a striking instance of the alleged danger in one of Maitland's inoculations at Hertford, an inoculated child, with only twenty pustules, having been supposed the probable source of the natural smallpox in five domestics, of whom one died. The death of the Duchess of Bedford by the natural smallpox in 1724 happened "after two of her children were recovered of that distemper, which they both had by inoculation[2]." That risk, however, was little made of in the controversy, although it may have been one of the

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[1] Douglass to Colden, 1 May, 1722, in *Massach. Hist. Soc. Collect.* Series 4, vol. II. p. 169.

[2] Philip Rose, M.D., *Essays on the Smallpox.* London, 1724, p. 76.

tacit reasons that led to the total abandonment of inoculation during the ten or twelve years after 1728. On the revival of the practice after 1740, when the serjeant-surgeons, the physicians and the apothecaries were all making it a considerable part of their business among the richer classes, the danger from contagion was either non-existent or it was not realized. In 1754 the College of Physicians of London, by a formal minute, recommended inoculation as "highly salutary to the human race," without one word of warning on the risk of contagiousness. That objection was raised again when Sutton's practice in 1765—67 was drawing large crowds to be inoculated. He was put on his trial at the Chelmsford Summer Assizes in 1766 on a charge of spreading the contagion of smallpox, which was epidemic in the town; but the grand jury, charged by Lord Mansfield, threw out the bill. Sutton's defence was to have been that he never brought into Chelmsford a patient capable of spreading the smallpox, that is to say, an inoculated person with smallpox enough on him to spread contagion[1]. Shortly after came the controversy between Lettsom and Dimsdale as to inoculation of infants at their homes, which turned upon the risk of increasing the natural smallpox by a constant succession of artificial cases. Lettsom's position was the same as Sutton's, that the quantity of smallpox matter (he might have said the quality also) produced by inoculation was not sufficient to create an appreciable risk. As to the matter of fact, the quantity was indeed small: Sir William Watson declared that a single limb of an adult person in a moderate attack of the natural smallpox had as many pustules on it as all the seventy-four children, in one of his inoculations at the Foundling Hospital, had on their whole bodies. In the theory of contagion, an infinitesimal quantity is sufficient; but in reality it appears that contagion must be in excess to be effective, just as, in the nearest physiological analogy, fertilization seems to depend upon the copiousness of the pollen or seminal particles[2].

The opposition to Lettsom's project of general inoculations among the infants of the working classes in cities shows that the risk of contagion was made to serve at least an argumentative purpose. As to experience, Lettsom in 1778 declared that he knew no instance of contagion from that source during two years of inoculations among the poor of London[3]. One writer of the time (1781) appealed boldly to the experience of sixty years: "Upon the first introduction of inoculation, physicians, divines, and innumerable other writers [who were they?] cried out that the infection would be spread, and the community suffer a greater loss; but after sixty years' experience, we should expect those arguments, as well as the writers, had all died away, and that at this day the same stale dregs of ignorance and obstinacy would not be again retailed[4]." The risk, however, was not altogether imaginary. Some cases of smallpox caught from the inoculated were known. In Vienna

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[1] Rev. R. Houlton, App. to *A Sermon in Defence of Inoculation*, Chelmsford, 1767, p. 59: "For, had the indictment been found, he would have assuredly nonsuited his enemies, and have proved beyond a possibility of doubt that he never brought into Chelmsford a patient who was capable of infecting a bystander, notwithstanding such person would convey infection by inoculation. However paradoxical this may seem, it is truth, and would have been proved to a demonstration."

[2] Darwin, *Animals and Plants under Domestication*, II. 356: "From these facts we clearly see that the quantity of the peculiar formative matter which is contained within the spermatozoa and pollen-grains is an all-important element in the act of fertilization, not only for the full development of the seed, but for the vigour of the plant produced from such seed."

[3] J. C. Lettsom, M.D., *A Letter to Sir Robert Barker, F.R.S. and G. Stackpoole, Esq. upon General Inoculation*. London, 1778, p. 8.

[4] W. Black, M.D., *Observations Medical and Political on the Smallpox, etc.* London, 1781, p. 103.

at that time the rule was to allow no inoculations except on groups of subjects isolated for the purpose. When Jenner, in 1798, enumerated the advantages of cowpox over smallpox for inoculation, in certain specified circumstances, one of his points was its non-contagiousness[1].

The favourable reception of his project seems to have been determined more upon that point than upon any other. The theoretical risk of contagion from inoculated smallpox became at once an actual danger to the community when it was perceived that they had in "smallpox of the cow" a non-contagious variety. Jenner was not slow to use that growing sentiment so as to discredit the old practice. As early as 1802 he began to urge privately the statutory prohibition of smallpox for inoculation, and Wilberforce, among others, took the matter up publicly. The College of Physicians, having been asked by Parliament in 1807 to inquire into the causes that hindered the progress of Jenner's inoculation, inserted the following paragraph in their report:

"Till vaccination becomes general, it will be impossible to prevent the constant recurrence of the natural smallpox by means of those who are inoculated, except it should appear proper to the Legislature to adopt, in its wisdom, some measure by which those who still, from terror or prejudice, prefer the smallpox to the vaccine disease, may in thus consulting the gratification of their own feelings, be prevented from doing mischief to their neighbours[2]." The same year, in the court of King's Bench, a medical practitioner was sentenced to fine and imprisonment for having neglected to prevent an inoculated person from communicating with others[3].

Next year, 1808, a bill was brought into the House of Commons by Mr Fuller, with the following preamble: "Whereas the inoculation of persons for the disorder called the Smallpox, according to the old or Suttonian method, cannot be practised without the utmost danger of communicating and diffusing the infection, and thereby endangering, in a great degree, the lives of his Majesty's subjects."...This bill, which had clauses also for notification and compulsory isolation of smallpox cases, the churchwardens to be the authority, was not persevered with. The inoculators by the old method opposed it, and they were joined by Joseph Adams, who had been the first English writer to mention cowpox, in 1795, and had been a staunch vaccinist subsequently[4]. In 1813 another attempt was made to restrict the practice of inoculating the smallpox on the ground of danger from its contagion, and to get cowpox substituted for it among the poorer classes. The Vaccine Board were the promoters, Lord Boringdon (afterwards Earl of Morley) having charge of the bill in the House of Lords. It was successfully opposed by the Lord Chancellor (Eldon) and by the Lord Chief Justice (Ellenborough), the latter contending that the common law was a better remedy than a statute against the nuisance of contagion from inoculated smallpox. Next year, 1814, Lord Boringdon brought in a new bill, which did not directly harass the inoculation interest, but made the rival method of cowpox obligatory upon the poor. Its provisions were ridiculed by Lord Stanhope, who got help from Lords Mulgrave and Redesdale to throw it out. Therewith ceased for many years

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[1] "But, in the cowpox, no pustules appear, nor does it seem possible for the contagious matter to produce the disease from effluvia, or by any other means than contact, and that probably not simply between the virus and the cuticle; so that a single individual in a family might at any time receive it without the risk of infecting the rest, or of spreading a distemper that fills a country with terror."

[2] *Parliamentary Papers*, 1807, 8th July.

[3] Bateman, *Reports etc.* 1819, p. 102. The principle of the Common Law on which the judgment rested was, "Sic utere tuo ut alienum non laedas."

[4] Joseph Adams, *An Inquiry into the Laws of Epidemics, with Remarks on the Plans lately proposed for Exterminating the Smallpox.* London, 1809. The *Edin. Med. and Surg. Journal* (VI. 231), in a long review of this essay, declared that Adams was inconsistent in reaffirming his old faith in cowpox and at the same time demanding liberty for the inoculators.

the talk about the contagiousness of inoculated smallpox, together with the attempts in Parliament to enforce the rival inoculation. The next attempt, in 1840, was successful in making variolation a felony, and in throwing on the rates the cost of vaccinating the infants of the poorer classes. The danger of contagion from inoculated smallpox in 1840 was no greater than it had ever been, and it had never been appreciable among the things favouring an epidemic.

The common-law maxim, "sic utere tuo ut alienum non laedas," which gained statutory force as against inoculation by the Act of 1840, was farther extended and specifically applied in the Act of 1853, which enforced the inoculation of cowpox upon all infants before they were three months old. Legislation, as we know, broadens down from precedent to precedent. Parliament in 1853 did not debate the preamble of the Bill, but accepted the principle established by the Act of 1840,—in the constructive sense that to leave infants without the inoculation of cowpox was, in effect, "to expose them so as to be infectious," because they were sure to take smallpox, and so to become nuisances to others "unprotected" as well as (less obviously) to their cowpoxed neighbours.

Other effects of the epidemic of 1837-40 on medical opinion.

A second inoculation, except as a mere test of the first and within a few weeks thereof, was no part of the original 18th century teaching and practice. The theory of inoculation being based upon the familiar experience that we seldom have the same infectious disease twice in a lifetime, it was held that inoculation, if it were effective, was the giving of smallpox once for all, and that it could not really be given a second time unless the first inoculation had been ineffective. As soon as cowpox was recommended, it was remarked as a strange thing that this disease, according to current accounts of it, was actually acquired by milkers time after time. That fact in its natural history, said the *Medical and Physical Journal* of January, 1799, was "received with general scepticism merely on account of its improbability." Dr Pearson was so troubled by the apparent inconsistency that he wrote to Dr Jenner in 1798 to ask whether it were really so; and although the latter confirmed the matter of fact, Pearson went on denying it, and did actually deny it as late as the Report of the Vaccine Pock Institution for 1803. Again, the report of the Whitehaven Dispensary for 1801, while it admitted the matter of fact, adverted to the anomaly in these words: "As we know from experience that the cowpock can

be repeatedly introduced by inoculation, it appears remarkable that it can act as a preventive of a similar equally specific but more malignant disease." Those were theoretical difficulties, which the practical minds of the profession did not stand upon. When we next hear of the possibility of having cowpox more than once, it is no longer an intellectual stumbling-block but is turned to account in the way of re-vaccination. *Lapidem quem reprobaverunt aedificantes, hic factus est in caput anguli.*

The practice of re-vaccination was usual on the Continent long before the English took to it. The reason of this was that a second inoculation of cowpox was not resorted to for the greater security of infants and young children, who were then the principal victims of smallpox in this country, but for the protection of adults, who made a great part of the subjects of the epidemics in other countries. There were so many adult deaths in the great Paris epidemic of 1825 that the news of it reads like the English references to smallpox in the time of the Stuarts. We obtain exact statistics of the ages in the 3323 fatal cases of smallpox in Paris from 1842 to 1851. Reduced to percentages they were as follows:

All ages	0—5	5—10	10—20	20—30	30—40	Over 40
100	33·8	5·9	13·25	32·95	10·95	3·15

Two-thirds of the deaths were above the age of five years, an age-incidence that was not reached in London until a whole generation after. The contrast with British experience comes out in concrete form in the following table of the age-incidence of 342 fatal attacks of smallpox in 1850 and 364 in 1851, in Paris (pop. 1,000,000), and of 584 fatal attacks in Glasgow in the single year 1852 (pop. 370,000)[1]:

Age-incidence of fatal Smallpox in Paris and in Glasgow

	Paris, 1850-51 (706 deaths)	Glasgow, 1852 (584 deaths)
Under one year	126	188
One to two	32	150
Two to five	94	189
Five to ten	31	20
Ten to fifteen	20	4
Fifteen to twenty	51	2
Twenty to twenty-five	109	19
Twenty-five to thirty	89	2
Thirty to forty	128	8
Forty to fifty	22	1
Over fifty	4	1

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[1] J. C. Steele, M.D., "Increase of Smallpox in Glasgow." *Glas. Med. Journ.* N.S. I. 59. The Paris figures are cited from the *Annuaire pour l'an* 1852-53.

In other parts of the Continent of Europe the frequency of smallpox in adults was not less remarked than in France in the second quarter of the 19th century. English writers had been able at one time to point to foreign countries for the success of infantile vaccination. Sweden and Denmark were for a long time classical illustrations; then it was Germany's turn. "In Berlin during 1821 and 1822," said Roberton, "only one died of smallpox in each year. In the German States, vaccination has become universal, and in them as well as in various other countries the smallpox is almost unknown." When we next find German experience appealed to, it is to enforce the need of re-vaccination: "In 1829," said Gregory, "the principal Governments of Germany took alarm at the rapid increase of smallpox, and resorted to re-vaccination as a means of checking it. In Prussia, 300,000 had been re-vaccinated, and the same number in Würtemberg. In Berlin nearly all the inhabitants had undergone re-vaccination[1]." It was about the same time that a second vaccination became obligatory in the armies of Prussia, Würtemberg, Baden and other German States, and among the pupils of schools when they reached the age of twelve years. Dr Gregory, in his speech at the Medical and Chirurgical Society of London in December, 1838, urged the need of re-vaccination not only by the example of Germany, but also by the experience of Copenhagen, where a thousand cases of smallpox had been received into the hospital (it was nearly always adults that were taken to the general hospitals) in twenty-one months of 1833–34, nine hundred of them being of vaccinated persons[2]. Gregory was in advance of his age in advocating re-vaccination for England. His own cases at the Smallpox Hospital of London were, it is true, nearly all adults, according to the rules of the charity. But they were not representative even of the smallpox of the capital; and in England at large smallpox in 1839 was still distinctively a malady of the first years of life. It was not until youths and adults began to have smallpox in large numbers in the epidemic of 1871–72 that the doctrine of re-vaccination was generally apprehended in England. Medical truth, like every other kind of truth except that of geometry, is conditioned by time and place. What was a truth to the Germans in 1829 was not a

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[1] I do not, of course, answer for the correctness of Gregory's statements.

[2] *Lancet*, 12 Dec. 1838.

truth to us until some forty years after. Dr Gregory, Sir Henry Holland and others advised re-vaccination after the epidemic of 1837–40; but as late as 1851 the National Vaccine Establishment denounced it as incorrect in theory and uncalled-for in practice.

After the great epidemic of 1837–40, there was an interval of a whole generation until smallpox broke out again on anything like the same scale, in 1871 and 1872. But it had risen to a considerable height at shorter intervals—in 1844–45, which were the years when vast numbers of navvies were employed making railroads all over England, in 1847 and successive years to 1852, which was the period of the great Irish migration after the potato-famine, in 1858, for which I find no explanation, and in the period from 1863 to 1865, which was again a time of somewhat high typhus mortality, not only in the Lancashire cotton-districts but also in London. The great epidemic of 1871 and 1872 finds no better explanation than our neighbourhood to Germany and Belgium, where the mortality from smallpox was far greater than in Britain, and was doubtless favoured by the state of war in 1870–71. The following tables for London, and for England and Wales in comparison with measles, scarlatina and diphtheria, show the progress of smallpox from the epidemic of 1837–40 to the present time:

Smallpox Deaths in London from the beginning of Registration.

Year	Deaths	Year	Deaths	Year	Deaths
1837 (6 mo.)	763	1856	531	1875	46
1838	3817	1857	156	1876	736
1839	634	1858	242	1877	2551
1840	1235	1859	1158	1878	1417
1841	1053	1860	898	1879	450
1842	360	1861	217	1880	471
1843	438	1862	366	1881	2367
1844	1804	1863	1996	1882	430
1845	909	1864	547	1883	146
1846	257	1865	640	1884	898
1847	255	1866	1391	1885	914
1848	1620	1867	1345	1886	5
1849	521	1868	597	1887	7
1850	499	1869	275	1888	5
1851	1062	1870	973	1889	0
1852	1150	1871	7912	1890	3
1853	211	1872	1786	1891	1
1854	694	1873	113	1892	11
1855	1039	1874	57	1893	206

England and Wales: Deaths by Smallpox, Measles, Scarlatina and Diphtheria from the beginning of Registration.

	Smallpox	Measles	Scarlet Fever	Diphtheria
1837 (½)	5811	4732	2550	—
1838	16268	6514	5862	—
1839	9131	10937	10325	—
1840	10434	9326	19816	—
1841	6368	6894	14161	—
1842	2715	8742	12807	—
1847	4227	8690	14697	—
1848	6903	6867	20501	—
1849	4644	5458	13123	—
1850	4665	7082	13371	—
1851	6997	9370	13634	—
1852	7320	5846	18887	—
1853	3151	4895	15699	—
1854	2868	9277	18528	—
1855	2523	7354	16929	385
1856	2277	7124	13557	603
1857	3236	5969	12646	1583
1858	6460	9271	23711	6606
1859	3848	9548	19310	10184
1860	2749	9557	9681	5212
1861	1320	9055	9077	4517
1862	1638	9860	14834	4903
1863	5964	11340	30473	6507
1864	7684	8322	29700	5464
1865	6411	8562	17700	4145
1866	3029	10940	11683	3000
1867	2513	6588	12380	2600
1868	2052	11630	21912	3013
1869	1565	10309	27641	2606
1870	2620	7543	32543	2699
1871	23062	9293	18567	2525
1872	19022	8530	11922	2152
1873	2308	7403	13144	2531
1874	2084	12235	24922	3560
1875	849	6173	20469	3415
1876	2468	9971	16893	3151
1877	4278	9045	14456	2731
1878	1856	9765	18842	3498
1879	536	9185	17613	3053
1880	648	12328	17404	2810
1881	3698	7300	14275	3153
1882	1317	12711	13732	3992
1883	957	9329	12645	4218
1884	2216	11324	11143	5020
1885	2827	14495	6355	4471
1886	275	12013	5986	4098
1887	506	16765	7859	4443
1888	1026[1]	9784	6378	4815
1889	23	14732	6698	5368
1890	16	12614	6974	5150
1891	49	12673	4959	5036
1892	431	13553	5618	6552
1893	1455	10764	6869	8918

[1] 409 of these in Sheffield.

The great epidemic of 1837–40 was the last in England which showed smallpox in its old colours. The disease returned once more as a great epidemic in 1871–72, after an interval of a whole generation (in which there had been, of course, a good deal of smallpox); but the epidemic of 1871–72 was different in several important respects from that of 1837–40. It was a more sudden explosion, destroying about the same number in two years (in a population increased between a third and a half) that the epidemic a generation earlier did in four years. It was an epidemic of the towns and the industrial counties, more than of the villages and the agricultural counties; it was an epidemic of London more than of the provinces; and it was an epidemic of young persons and adults more than of infants and children. The great epidemic of 1871–72 brought out clearly for the first time all those changes in the incidence of smallpox; but things had been moving slowly that way in the whole generation between 1840 and 1871. Experience subsequent to 1871–72 has shown the same tendency at work.

To begin with the changed incidence upon rural and urban populations, a glance down the following Table, will show that the counties marked*, with a smaller share in 1871–72, in a total

Incidence of the Smallpox Epidemics of 1837–40 (*four years*) *and* 1871–72 (*two years*) *respectively upon the Counties of England and Wales.*

	1837–40	1871–72
England and Wales	41,253	42,084
Metropolis	6421	9698
*Surrey (extra-metr.)	383	231
*Kent (extra-metr.)	817	537
*Sussex	161	126
Hampshire	348	1103
*Berkshire	450	46
*Middlesex (extra-metr.)	418	306
*Hertfordshire	260	157
*Buckinghamshire	268	53
*Oxfordshire	199	109
Northamptonshire	399	563
*Huntingdonshire	65	14
Bedfordshire	125	128
*Cambridgeshire	400	175
*Essex	773	583
*Suffolk	506	348
*Norfolk	1038	895
*Wiltshire	548	85
*Dorsetshire	329	163
*Devonshire	1097	838
*Cornwall	767	531
*Somersetshire	1466	412
*Gloucestershire	1072	323
*Herefordshire	191	34
*Shropshire	345	161
*Worcestershire	1002	529
Staffordshire	1328	3050
*Warwickshire	957	785
Leicestershire	528	622
Rutlandshire	8	7
Lincolnshire	482	498
Nottinghamshire	562	983
*Derbyshire	329	297
*Cheshire	1141	310
†Lancashire	7105	4151
†Yorkshire W. Riding	2858	2609
„ E. Riding	480	452
„ N. Riding	236	405
Durham	798	4767
Northumberland	569	1512
*Cumberland	549	366
*Westmoreland	98	41
Monmouthshire	672	904
*Wales	2699	2314

of deaths in all England and Wales which was nearly the same as in the great epidemic a generation before, are nearly all those with a population more purely rural[1]:

The counties which were most lightly visited in 1871–72, as compared with 1837–40, were the agricultural and pastoral. In the outbreaks subsequent to 1871–72, smallpox has almost ceased to be a rural infection in Scotland and Ireland as well as in England. The great change that has come over it in that respect is shown in the following table, in which the annual death-rates from smallpox per 100,000 living are contrasted, for children under five, in each of several agricultural counties, with the mean of all England and of London, 1871-80, and with the corresponding scarlatinal death-rates in the right-hand column:

Annual Death-rates of Children under five, per 100,000 *living*, 1871–80.

	Smallpox	Scarlatina
All England	53	349
London	113	307
Sussex	9	100
Berkshire	4	141
Bucks	4	160
Oxfordshire	9	167
Huntingdonshire	3	205
Bedfordshire	11	242
Cambridgeshire	18	112
Suffolk	12	136
Wiltshire	5	210
Dorsetshire	15	152
Herefordshire	5	166
Shropshire	12	247

But the history of smallpox since the great epidemic of 1871–72 has brought out still another tendency in the same direction, namely, the increasing share of London in the whole smallpox of England. In the epidemic of 1837–40, which reached to almost every parish of England and Wales, London had 6449 deaths in a total of 41,644, or between a sixth and a seventh part, having rather less than an eighth part of the population. In the epidemic of 1871–72, London had between a fourth and a fifth part of the deaths (9698 in a total of 42,084),

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[1] There are two notable exceptions, marked †, Lancashire and Yorkshire; but, in regard to their higher mortality from smallpox in 1837–40, it should be kept in mind that they were the chief scenes of the great distress among the working class in those years, the same causes which produced an enormous mortality from typhus fever in adults having tended to increase the fatality of smallpox among the children.

having then about a seventh part of the population. In 1877, more than half of all the smallpox deaths were in London, and in the year after as many as 1417 in a total of 1856. In 1881, London had about two-thirds of the deaths from smallpox in all England and Wales; but in the epidemic of 1884–85, it had only over a third part (1812 in a total of 5043). This excess of London's share over that of the provinces is expressed in the following table, showing the respective rates of smallpox mortality per million of the population:

Smallpox Deaths in London and the Provinces, per million of population.

	1847–9	1850–4	1855–9	1860–4	1865–9	1870–4	1875–9	1880–4
London	460	300	237	281	276	654	292	244
Provinces	274	271	192	175	172	339	48	34

If the table were continued to the very latest date, it would show the provinces recovering their share, but upon a slight prevalence of the epidemic as a whole, the deaths in London having been mere units from 1886 to 1892, while in 1888 there was a severe epidemic in Sheffield and in 1892–93 a good deal of the disease in a few manufacturing towns of the North-western and Midland divisions. It would be a not incorrect summary of the incidence of smallpox in Britain to say, that it first left the richer classes, then it left the villages, then it left the provincial towns to centre itself in the capital; at the same time it was leaving the age of infancy and childhood. Of course it did none of these things absolutely; but the movement in any one of those directions has been as obvious as in any other. Measles and scarlatina have not shown the same tendency to change or limit their incidence. Smallpox may have surprises in store for us; but, as it is an exotic infection, its peculiar behaviour may not unreasonably be taken to mean that it is dying out,—dying, as in the death of some individuals, gradually from the extremities to the heart.

With all those changes, the fatality of smallpox, or the proportion of deaths to attacks, came out in the great epidemic of 1871–72 curiously near that of the 18th century epidemics, namely, one death in about six cases. This rate comes from the hospitals of the Metropolitan Asylums Board according to the following table:

Admissions for Smallpox, with the Deaths, at the hospitals of the Metropolitan Asylums Board, from the opening of the several hospitals to 30 *April*, 1872.

Age-periods	Males			Females			Both Sexes		
	Adm.	Died	Percentage of deaths	Adm.	Died	Percentage of deaths	Adm.	Died	Percentage of deaths
Under 5	434	235	54·15	469	236	50·32	903	471	52·15
5—10	851	236	27·73	821	196	23·87	1672	432	25·83
10—20	2827	265	9·37	2513	237	9·43	5340	502	9·40
20—30	2561	465	18·15	1922	285	14·82	4483	750	16·72
30—40	939	244	26·00	665	136	20·45	1604	380	23·69
40—50	316	100	31·64	242	64	26·45	558	164	29·39
50—60	85	18	21·17	88	31	35·22	173	49	28·32
Above 60	40	8	20·00	35	7	20·00	75	15	20·00
	8053	1571	19.49	6755	1192	17·64	14,803	2763	18·65

These admissions to hospitals included attacks of every degree of severity, the intention of the hospitals being to isolate all cases, mild and severe alike; so that, although these are technically hospital cases, they are not comparable to the select class admitted to the old Smallpox Hospital of London, but to the cases of smallpox in former times in the community at large. Although the general average of deaths in 14,808 cases, namely, 18·65 per cent., is nearly the same as (being slightly higher than) that of the equally comprehensive totals of 18th century cases given at p. 518, yet the average is made up in a different way. In some of the 18th century epidemics, such as that of Chester in 1774, all the deaths were under ten years of age, and yet the average rate of fatality was only 14 or 15 per cent. The much higher rate of fatality from birth to five years and from five years to ten in the London epidemic of 1871–72 (which is confirmed in part by the Berlin statistics of the same years), must have had some special reasons. One reason, doubtless, was that the attack of smallpox in recent times has fallen upon comparatively few children, whereas in former times it fell upon nearly the whole; and it may be inferred that the infants who have been in recent times subject to the attack of smallpox have also been of the class that are most likely to die of it. The high rates of fatality at the ages above thirty in the table agree with the experience of all times.

The percentages of fatalities from smallpox in the hospitals of the Metropolitan Asylums Board have varied as follows from their opening to the present time:

	Cases	Percentage of deaths		Cases	Percentage of deaths
1 Dec. 1870—			1881	8671	16·61
3 Feb. 1871	582	20·81	1882	1854	12·96
4 Feb. 1871—			1883	626	16·06
31 Jan. 1872	13,145	18·95	1884	6567	15·98
1872-3	2362	17·84	1885	6344	15·8
1873-4	191	17·02	1886	132	14·28
1874 (11 mo.)	120		1887	59	
1875	111		1888	67	
1876	2150	21·64	1889	5	
1877	6620	17·92	1890	27	
1878	4654	17·99	1891	64	
1879	1688	15·69	1892	348	11·29
1880	2032	15·95	1893	2376	7·75

The decline in average fatality in the last two years is remarkable, and is to be explained chiefly by the mild type of smallpox which has been prevalent; a very small fraction of the patients attacked between the ages of ten and twenty-five have died; and these are some two-fifths of the whole. This is shown in the following age-table of 2374 cases admitted to the Metropolitan Board Hospitals in 1893:

Smallpox in London, 1893.

Age-period	Cases	Deaths	%	Age-period	Cases	Deaths	%
0—5	168	53	31·5	30—35	250	14	5·6
5—10	191	16	8·3	35—40	182	13	7·1
10—15	230	7	3·0	40—50	199	18	9·0
15—20	340	7	2·0	50—60	79	9	11·4
20—25	393	13	3·3	60—70	35	6	17·1
25—30	298	23	7·7	70—80	9	1	11·1

The low rate of fatality during the slight epidemic revival of smallpox in 1892-93 has been found to obtain wherever the disease has occurred:

Smallpox in the Provinces, 1892-93.

	Cases	Deaths	Fatalities per cent.
Birmingham	1203	96	8
Warrington	598	60	10
Halifax	513	44	8·5
Manchester	406	27	6·7
Glasgow	279	23	8·2
Liverpool	194	15	7·7
Brighouse	134	15	11·2
Aston Manor	113	6	5·3
Leicester	362	21	5·8
St Albans	58	6	10·4
	3860	313	8·10

The ages under ten years had only 290 in 3644 of these cases; but those 290 cases had 70 in 302 of the deaths.

In the comparative table for Ireland, of deaths by smallpox, measles, scarlatina and diphtheria, measles in a decreasing population has changed little, while scarlatina has declined greatly, and smallpox has fallen during the last ten years almost to extinction.

Ireland: Deaths by Smallpox, Measles, Scarlatina and Diphtheria from the beginning of Registration.

	Smallpox	Measles	Scarlatina	Diphtheria
1864	854	630	2605	661
1865	461	1036	3683	480
1866	194	851	3501	317
1867	21	1292	2145	189
1868	23	1251	2696	202
1869	20	948	2670	243
1870	32	954	2978	188
1871	665	547	2707	226
1872	3248	1380	2459	257
1873	504	1303	2092	326
1874	569	667	4034	565
1875	535	898	3845	443
1876	24	664	2112	368
1877	71	1562	1117	288
1878	873	2212	1079	296
1879	672	860	1688	320
1880	389	1025	1344	314
1881	72	402	1230	323
1882	129	1518	2443	385
1883	16	801	1765	239
1884	1	559	1377	354
1885	4	1323	1147	296
1886	2	284	850	336
1887	14	1307	973	381
1888	3	1935	849	447
1889	0	574	457	358
1890	0	726	319	346
1891	7	240	308	281
1892	0	1183	419	286

In the great Irish famine of 1846–49, comparatively little is heard of smallpox. It would appear to have been less diffused through the country than in former famines, such as that of 1817–18, or those of the first part of the 18th century, just in proportion as the vagrancy of famine-times was checked by the establishment of workhouses. In the workhouses and auxiliary workhouses during the ten years 1841–51, smallpox is credited with 5016 deaths, while measles has 8943, fever 34,644, dysentery

50,019, diarrhoea 20,507, and Asiatic cholera 6716. Registration began in Ireland in 1864, and showed little smallpox for the first few years. The next great epidemic, of 1871–72, showed the incidence upon the large towns, and the comparative immunity of the country population, even more strikingly than in England. In a total mortality of 3913 during the two years of 1871 and 1872, the three counties of Dublin, Cork and Antrim had the following enormous share, which fell mostly to the three cities of Dublin, Cork and Belfast:

Dublin Co.	1825
Cork Co.	1070
Antrim	510
	3405 deaths in 3913 for all Ireland.

In that epidemic the whole province of Connaught had only 25 deaths from smallpox; but a subsequent visitation, a few years after, fell mainly upon Connaught.

The epidemic which began in Scotland in 1871 was distributed over a somewhat longer period than the corresponding outbreak in England; but the bulk of it fell in the two years 1871 and 1872. The total of 3890 deaths in those two years was distributed as follows:

Eight largest towns	2441
Next largest towns	259
Small town districts	574
Mainland rural districts	586
Insular rural districts	30
	3890

Glasgow had a considerably smaller relative share than Edinburgh, and altogether a much lighter incidence of the disease than in the years 1835–52, for which the figures have been given above (pp. 600–1). In the following table of the annual deaths in Scotland from the beginning of registration, the four other infective diseases of childhood included along with smallpox show by comparison the remarkable decline of smallpox since 1874, scarlatina being the only other infection of childhood which has become greatly less common or less fatal.

Scotland. Deaths by Smallpox, Measles, Scarlatina, Diphtheria and Whooping-Cough, from the beginning of Registration.

	Smallpox	Measles	Scarlatina	Diphtheria	Whooping-Cough
1855	1209	1180	2138	—	1903
1856	1306	1033	3011	—	2331
1857	845	1028	2235	76	1539
1858	332	1538	2671	294	1963
1859	682	975	3614	415	2660
1860	1495	1587	2927	480	1812
1861	766	971	1764	681	2204
1862	426	1404	1281	997	2799
1863	1646	2212	3413	1745	1649
1864	1741	1102	3411	1740	1993
1865	383	1195	2244	995	2318
1866	200	1038	2706	685	1860
1867	100	1341	2253	610	1728
1868	15	1149	3141	749	2490
1869	64	1670	4680	663	2461
1870	114	834	4356	630	1783
1871	1442	2057	2586	880	1504
1872	2448	925	2101	1045	2850
1873	1126	1450	2227	1203	1598
1874	1246	1103	6321	1163	1690
1875	76	1022	4720	867	2431
1876	39	1241	2364	861	2250
1877	38	1019	1374	956	1571
1878	4	1372	1870	1033	2788
1879	8	769	1592	862	2483
1880	10	1427	2165	838	2641
1881	19	1012	1573	816	1620
1882	3	1289	1583	961	2108
1883	11	1629	1336	747	2968
1884	14	1440	1266	830	2511
1885	39	1426	944	688	2157
1886	24	681	1058	583	1882
1887	17	1598	1179	805	3212
1888	3	1406	732	872	1722
1889	8	1948	701	968	2268
1890	0	2509	739	1018	3039
1891	0	1775	736	830	2437

The age-incidence of Smallpox in various periods of history.

Among the various changes of incidence that have attended the recent decline of smallpox in England, Ireland and Scotland, there is one that calls for more extended notice, namely, the fact that the malady has in great part ceased to be an infection of infancy and childhood and has become more distinctively an infection of adolescence and mature age. In no period of its history has smallpox been so purely an infantile complaint

as measles[1], nor so purely a malady of childhood and early youth as scarlatina or diphtheria[2]. When it first rose to prominence in England, from the reign of James I. onwards, it attacked adults in a large proportion; of which fact the evidence, although not statistical, is sufficient. But, as the disease became nearly universal and ubiquitous, it was so commonly passed in infancy or childhood, that few grew to maturity without having had it. The number of adult cases diminished in proportion as the disease became more nearly universal. In the great period of smallpox in the 18th century, about nine-tenths of the deaths occurred under the age of five, and nearly all the remaining fraction between five and ten years, at Manchester, Chester, Warrington, Carlisle and Kilmarnock. But in London there were always a good many adult deaths, the reason commonly given being that there was a steady influx to the capital of domestic servants and others from country parishes where the epidemics came at sufficiently long intervals to let many children grow up without incurring the risk of it. Also at Geneva and the Hague, in the 18th century, there were many more deaths above the age of five than in the English provincial towns at the same time.

Ages at Death from Smallpox at Geneva (including Measles) and at the Hague (Duvillard).

	All ages	0–1	–2	–3	–4	–5	–6	–7	–8	–9	–10	–15	–20	–25	–30	–35	–40	–45
Geneva (1700–83)	3328	555	608	588	426	346	232	185	99	67	44	84	36	26	21	0	0	0
The Hague (15 years of 18th cent.)	1455	172	170	179	224	160	148	114	78	58	23	47	17	24	14	10	8	3

Twenty-four per cent. of the smallpox deaths in the 18th century at Geneva were above the age of five years, and at the Hague thirty-seven per cent., while in the former the ratio would probably have been higher but for the inclusion of measles. But, with this comparatively high ratio of deaths above the age of five, smallpox was a much less important cause of mortality at Geneva and the Hague than at Manchester, Glasgow, Chester, and most other provincial cities of this country, making about a fifteenth part of the deaths from all causes in the former, and as high as a sixth part in the latter.

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[1] In the first universal and very fatal epidemic of measles, that of 1808, a good many adults, who had not had measles before, were attacked. See the chapter on Measles.

[2] The accounts by Fothergill, Wall and others, of the malignant sore-throat with scarlet rash about 1740 give prominence to cases in early manhood or womanhood.

The infantile character of smallpox was as marked as ever in the epidemic of 1817–19; of which the Norwich statistics are sufficient proof. As late as the epidemic of 1837–40, smallpox was still distinctively a malady of infants and young children in Britain, although that was by no means the case on the continent of Europe at the same time. The following was the age-incidence of fatal smallpox at Liverpool and Bath in the last six months of 1837.

		At all ages	Under 1	1–2	2–3	3–4	4–5	5–6	6–10	Above 10
Liverpool	Deaths	495	143	127	77	64	24	19	20	25
	Ratios per cent.	100	28·65	25·45	15·43	17·63		7·81		5·01
Bath	Deaths	151	33	31	33	17	17	6	6	10
	Ratios per cent.	100	21·56	20·26	21·56	22·2		7·84		6·53

In the third year of the epidemic, 1839, the ratio of deaths above the age of five was still less at Manchester, Liverpool and Birmingham, being only four and a half per cent. (26 in a total of 522). At Glasgow, from 1835 to 1839, twelve per cent. of the smallpox deaths were above the age of five (see p. 600). These are the rates of provincial cities; but in a total of 8714 deaths in the year 1839, added together from London and the provinces, about twenty-five per cent. were over five, and of these a moiety were over ten years:

All ages	Under five	Five to ten	Above ten
8714	6453	1122	1139

A good deal of that mortality above the age of five must have come from London, according to the probability of the following table, which is of six years' later date, but the nearest that can be got for London alone:

London, 1845. *Ages at Death from Smallpox, Measles and Scarlatina.*

	Smallpox	Measles	Scarlatina
Total at all ages	909	2318	1085
Under One year	209	353	88
One to Two	133	832	167
Two to Three	91	511	181
Three to Four	81	272	183
Four to Five	63	153	115
Five to Ten	136	168	254
Ten to Fifteen	33	18	46
Fifteen to Twenty	34	3	14
Twenty to Twenty-five	54	1	8
Twenty-five to Thirty	38	2	6
Above Thirty	37	5	23

The ratio of smallpox deaths above five was 37·5 per cent., of measles deaths 8·4 per cent., and of scarlatina deaths 32·3 per cent. Measles and scarlatina have kept these ratios somewhat uniformly to the present time, but the ratio of smallpox deaths above the age of five has increased according to the following table for England and Wales from 1851 to 1890:

Period	Percentage of smallpox deaths above five years	Percentage of measles deaths above five years	Percentage of scarlatina deaths above five years
1851–60	38	10	36
1861–70	46	8	36
1871–80	70	8	34
1881–90	77	8	36

The progressive raising of the age of fatal smallpox is shown in another way by taking the ratio of the deaths per million living at all ages and at each of eleven age-periods[1]:

Smallpox Deaths per million living at each age-period.

Period	All ages	0–	5–	10–	15–	20–	25–	–35	–45	–55	–65	75 and over
1851–60	221	1034	257	73	93	130	92	53	38	24	18	14
1861–70	163	654	145	56	86	136	102	73	49	36	26	22
1871–80	236	527	284	137	197	300	239	168	111	71	46	35

It was the great epidemic of 1871–72 that brought out the change of age-incidence most concretely, just as it brought out, in contrast to the last great epidemic in 1837–40, the decline in the rural and the increase in the industrial centres. In the three years before the outburst of 1871 the deaths under five and over five were approaching an equality; in the epidemic itself the old ratios were suddenly reversed:

Year	Smallpox deaths under five	Smallpox deaths over five
1868	1234	818
1869	892	673
1870	1245	1375
1871	7770	15356
1872	5758	13336

In the whole generation between 1840 and 1871, in which there was no great and general epidemic of smallpox, many had passed from childhood to adolescence and maturity without encountering the risk of it. When the epidemic of 1871 began, it found many in youth or mature years who had not been through the smallpox, and it attacked a certain proportion of

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[1] *Supplement* (*Decennial*) *to the* 45*th Report of the Regr.-Genl.* 1885, p. cxii.

them accordingly. The proportion above the age of five so attacked in 1871–72 was greater than it had been in this country since the beginning of the 18th century; indeed, as the information is not in statistical form for the earlier period, it may be asserted, and it may happen to be true, that it was greater than it had ever been in this country at any time. The reason for the large proportion of adult cases was the same in the rise of smallpox as in its decline, namely, that in the respective circumstances an epidemic found many who had not been through the disease in infancy or childhood. The same happened in those parts of the world where the epidemics of smallpox came at long intervals, during which many had passed from childhood to youth or mature age without once encountering the risk of smallpox.

Such were the epidemics at Boston, New England, and Charleston, South Carolina, in the 18th century. Not only do the accounts of them speak of the disease as if it were mainly one of the higher ages, but it follows from the ratio of attacks to population, known in the case of Boston, that adolescence and adult age must have had a full share, considering that these age-periods included all who were protected by a previous attack. The years of epidemic smallpox at Boston were 1702, 1721, 1730 and 1752: of these four the two worst were 1721 and 1752, the one epidemic following a clear interval of nineteen years, the other a more or less clear interval of twenty-two years:

Smallpox in Boston, Massachusetts[1].

	Population, whites and blacks	Attacked by smallpox	Died of smallpox	Had smallpox before	Moved out of town
1721	10,565	5989	844	All the rest less 750	—
1752	15,684	5545	569	5598	1843

These enormous mortalities in Boston were comparable to those of the old plague itself in European cities, not only in falling upon all ages but also in doubling or trebling for a single year at long intervals the annual average of deaths:

	Deaths of whites	Deaths of blacks	Total
1701	146	—	146
*1702	441	—	441
1720	261	68	329
*1721	968	134	1102
1722	240	33	273
*1730	740	160	909
1731	318	90	408
*1752	893	116	1009

* Smallpox years.

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[1] The figures for 1721 are cited above (p. 485) from Douglass and others. Those for 1752 are given in the *Gent. Magaz.* 1753, Sept., p. 413, as "collected from the Accounts of the Overseers in the Twelve several Wards," and sent by the Rev. T. Prince.

Just as smallpox in its first great outbursts in the London of the Stuarts, or in its rare outbreaks in the American colonies in the 18th century, fell impartially upon children and adults, so in its last outbursts in the London of Victoria it fell upon persons at all ages. The notable thing is, not that smallpox should have of late been attacking adults, for that it has ever done except in times and places in which there were few or no adults who had not been through the disease in childhood; but that it should have ceased to so large an extent to attack infants and children. It has ceased to attack infants and children because other infective and non-infective diseases more appropriate to the modern conditions of the population are attacking them instead. These are measles and whooping-cough, scarlatina and diphtheria, infantile diarrhoea, and the more chronic after-effects of these. The annual death-rate from all diseases under the age of five has fluctuated somewhat per million living from 1837 to the present time, but it can hardly be said that it has fallen much or steadily[1].

Keeping still to the epidemic of 1871–72, let us consider whether there was any natural or epidemiological reason for its cutting off a smaller ratio of infants and children in its whole mortality than that of 1837–40 did. There had been a most disastrous epidemic of scarlatina for three years just before, which had caused 21,912 deaths in 1868, 27,641 in 1869, and 32,543 in 1870, a total of 82,096 in three years, about two-thirds of which were under the age of five, or at the age-period which smallpox used to be fatal to almost exclusively and to be the greatest single epidemic scourge of. Even in the two smallpox years themselves the scarlatinal deaths were 18,567 and 11,922, of which the share that fell to children under five was one and a half times the deaths in that age-period from the co-existing smallpox. The three years of excessive scarlatina, before the epidemic of smallpox began, had removed large numbers of the class of infants and children who succumb to any infectious disease; if we cannot give the whole *rationale* of one infection dispossessing or anticipating another, we can at least understand that the earlier and more dominant infection takes off the likely subjects. What scarlatina did egregiously during the three years just

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[1] *Supplementary Report of the Registrar-General*, 1883. The mean death rate per 1000 living, for the period 1838–82, has been 71·0 males, and 61·2 females under five years of age; but as late as 1878 the annual average was the mean of the period, namely 71·2 males and 61·1 females.

before the great explosion of smallpox, it had been doing steadily (along with measles, &c.) throughout a whole generation since the last great sacrifice of infants and children by smallpox in 1837–40. But the fact that scarlatina had in great part dispossessed smallpox among the factors of mortality under the age of five, did not prevent the latter infection from attacking those of the higher ages who were susceptible of it and were at the same time unvexed by any other great epidemic malady proper to their time of life. If the epidemic of smallpox in 1871–72 had cut off as large a ratio under the age of five years as its immediate predecessor in 1837–40 did, its whole mortality would have been about 70,000 more than it actually was. But in no state of the population or of the public health can we suppose that three years of excessive mortality of children by one kind of contagion would be followed immediately by two years of equally special mortality at the same ages by contagion of another kind. It is not only epidemiological science that tells us this, but also common sense—*est modus in rebus.*

The saving of life by checking the prevalence of smallpox was a favourite rhetorical topic in the 18th century. Voltaire, La Condamine, Bernoulli, Watson, Haygarth and others, were fond of estimating how many thousands of lives might be saved in a year if inoculation were thoroughly carried out. Dr Lettsom, Sir Thomas Bernard and Mr James Neild, who were interested in prison reforms and in whatever else would reduce the prevalence of typhus, reckoned the possible saving of life under that head as almost equal to the possible saving from smallpox[1]. For typhus there was no artificial means of restraint; it had to decline before natural causes, if it declined at all,—which, indeed, it has done. But no one at that time thought of keeping down smallpox except by the inoculation of itself or of cowpox. The economists and statisticians treated each of these artifices in its turn as a factor having a certain

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[1] Lettsom (*Gent. Magaz.* 1804, Aug. p. 701), in a preface to Neild's papers on the state of the prisons, estimated that 40,000 lives might be saved every year in England by preventing infectious fevers, "for in this metropolis my respectable friend Thomas Bernard, Esq., whose caution and accuracy no person will doubt, calculates the number of victims at 3000 each year [doubtless from the London Bills of Mortality]....If to this pleasing view we add the preservation of 48,000 victims to the smallpox, which may now be preferred by the cowpox, we have in our power to possess the sublime contemplation of forming a saving fund of human life of nearly 88,000 persons annually in this empire, by the exercise of reason, philanthropy and judicious policy."

absolute value, which they might use like the *a* and *b* of a problem in algebra. This they did, of course, in deference to medical authority. What Bernoulli had worked out for the old inoculation, Duvillard did for the new, in his "Tables showing the Influence of Smallpox on the Mortality of each period of Life, and the Influence that such a preservative as Vaccine may have on the Population and on Longevity[1]." Malthus fell into the conventional way of thinking when he assumed that smallpox alone among the epidemic checks of population was to be controlled artificially; but he introduced an important new consideration. "For my own part," he wrote in 1803, "I feel not the slightest doubt, that if the introduction of the cowpox should extirpate the smallpox, and yet the number of marriages continue the same, we shall find a very perceptible difference in the increased mortality of some other diseases[2]."

Five years after this was written, there came, in 1808, the disastrous epidemic of measles, which in Glasgow killed more infants in a few months than smallpox had ever done at its worst in the same city. In the winter of 1811–12 there was another severe epidemic of measles in Glasgow; and in 1813, Dr Watt, a leading physician of the place, and a man now famous in all countries for his vast labours as a bibliographer, gave to the world his statistical proof, from the Glasgow burial registers, of that law of substitution which Malthus had found necessary in his deduced principles.

> "The first thing," said Watt, "that strikes the mind in surveying the preceding Table (1783–1812), is the vast diminution in the proportion of deaths by the smallpox, a reduction from 19·55 to 3·90. But the increase in the subsequent column [measles] is still more remarkable, an increase from 0·95 to 10·76. In the smallpox we have the deaths reduced to nearly a fifth of what they were twenty-five years ago [in ratio of the deaths from all causes]; in the same period the deaths by measles have increased more than eleven times. This is a fact so striking that I am astonished it has not attracted the notice of older practitioners, who have had it in their power to compare the mortality by measles in former periods with what all of them must have experienced during the last five years[3]."

The high ratio of measles and the low ratio of smallpox did not remain as Watt's researches left them. When Cowan resumed the tabulation of figures from 1835 to 1839 he found the ratios of those two infantile infections almost equal, and the

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[1] Duvillard, *Tableaux etc.* Paris, 1806.

[2] *Essay on the Principle of Population.* Bk. IV. chap. 5.

[3] Robert Watt, M.D. *Treatise on Chincough, with Inquiry into the Relative Mortality of the Diseases of Children in Glasgow.* Glasgow, 1813.

two together contributing to the whole mortality of Glasgow only a little more than half their joint share in the end of the 18th century. The substitution which Watt saw during a few years was only the most dramatic part of a general movement forwards of measles among the causes of infantile mortality. He supposed, as everyone did at that time, that smallpox was forcibly repressed, and that another infectious disease had seized the opportunity to become exuberant. The most relevant thing in the whole situation was urged by those who thought, with Jenner, that the doctrine of substitution had an "evil tendency" as detracting from the absolute value of the inoculation principle. In order to discredit Dr Watt altogether, they pointed out that his ratios of smallpox and measles took no account of the diminished death-rate of Glasgow by all diseases in the earlier years of the 19th century.

Great changes were proceeding in the old city, the Glasgow of 'Rob Roy.' The population which was reckoned at 45,889 in the year 1785, had increased to 66,578 in the year 1791, and thereafter, at a slower rate, to 83,769 in 1801 and to 100,749 in 1811. The first great increase after the American War meant overcrowding; but in a short time new suburbs spread over such an extent that, in the year 1798, more than half the burials were in the graveyards attached to chapels-of-ease and meeting-houses outside the original parishes. The modern expansion of Glasgow, like that of London and of all other large cities, has been an increase of area still more than an increase of numbers. The public health improved steadily, at all events until 1817, the improvement being shown first in the increasing number of infants that survived their second year. That rise in the probability of life corresponded to the substitution of measles for smallpox, and in part depended upon the ascendancy of the milder infection. Still more remarkable was the rise of scarlatina, which Dr Watt did not live to see; so little was made of it at the date of his writing that he found "scarlatina, typhus, &c., all comprehended under the same head." The seeds of measles and scarlatina had long existed beside the seeds of smallpox, but the ascendancy of each of the two former had to wait events. Said Banquo to the witches who hailed Macbeth as king and himself as the sire of later kings:

> "If you can look into the seeds of time,
> And say which grain will grow, and which will not—"

The succession of reigning infections is the same problem. All we can say is that each new predominant type is somehow suited to the changed conditions. In the long period covered by this history we have seen much coming and going among the epidemic infections, in some cases a dramatic and abrupt entrance or exit, in other cases a gradual and unperceived substitution. Some of the greatest of those changes have fallen within the two hundred years since Sydenham kept notes of the prevalent epidemics of London. We are that posterity, or a generation of it, which he expected would have its own proper experiences of epidemics and at the same time would know all that had passed meanwhile—"posteris quibus integrum epidemicorum curriculum venientibus annis sibi invicem succedentium intueri dabitur."

CHAPTER V.

MEASLES.

In the earliest English writings on medicine, measles is the inseparable companion of smallpox; so closely are they joined in pathology and treatment that even the statements as to the pustules and scars of the eruption are in some compends made to apply to both without distinction. This singular conjunction of two diseases came originally from the Arabian teaching, which was everywhere authoritative in the medieval period, and especially authoritative in all that related to smallpox. In the Latin compends based upon Avicenna or other Arabic writers, the two names were *variolae* and *morbilli*, the former being as it were the *morbus* proper and the latter its diminutive. It can hardly be doubted that we owe the English name of measles as the equivalent of *morbilli* to John of Gaddesden. Originally the English word meant the leprous, first in the Latin form *miselli* and *misellae* (diminutive of *miser*), as in the histories of Matthew Paris, and later in the Norman-French form of *mesles*, as in the Acts of Parliament of Edward I. and in the 'Vision of Piers the Ploughman.' In the 15th century the leper-houses in the suburbs of London were called the "lazarcotes" or "meselcotes."

Gaddesden, by some unaccountable stretch of similarity, coupled the sores or tubercular nodules on the legs of "pauperes vel consumptivi," who were called "*anglicé* mesles," with the spotted rash of the Arabian "morbilli"; and it was doubtless this haphazard bracketting of two unlike diseases that led in course of time to the name of mesles being disjoined from its original sense of the leprous and restricted to the second member of Gaddesden's strangely assorted couple. In the time of Henry VIII. smallpox and mezils are familiarly named

together just as *variolae et morbilli* are an inseparable pair in the treatises of the Arabistic writers. A still more singular usurpation by "mezils" or "maysilles" or "measles" is met with in the Elizabethan period. In the vocabulary of Levins, a schoolmaster who was also a medical graduate of Oxford, the word *variolae* is rendered by "ye maysilles," while *morbilli* is omitted altogether among the Latin names and smallpox among the English; and in the English translation of Latin aphorisms appended to one of the works of William Clowes, surgeon to St Bartholomew's Hospital, *variolae* is in like manner translated "measles" on every occasion. In the English dictionary by Baret, belonging to the same period, measles is defined as "a disease with many reddish spottes or speckles in the face and bodie, much like freckles in colour"—which seems to exclude the possibility of a pustular disease having been part of the Elizabethan notion of measles.

Notwithstanding this singular usage of the vocabularies and dictionaries, the name of smallpox occurs by itself in letters or other memorials of the Elizabethan period, having been doubtless correctly applied to the true pustular *variola*. In the short essay on smallpox by Kellwaye, appended to his book on the plague (1593), measles and smallpox are distinguished on the whole clearly, according to the definitions of Fracastori or other foreign writers of the 16th century. The association between measles and smallpox that survived longest was a peculiar and somewhat uncommon one; certain cases of smallpox, in which the pustules were wholly or partially represented by, or changed into, broad spots level with the skin, red or livid in colour, and in which haemorrhages occurred from the nose, lungs, bowels or kidneys, that is to say, cases of haemorrhagic smallpox, were apt to be called, from the time of James I. until as late as the case of Queen Mary in 1694, by the name of "smallpox and measles mingled."

From the date of the annual bills of mortality by the Parish Clerks of London, the year 1629, it is improbable that there was any real confusion between smallpox and measles; there was certainly some ambiguity in the entry of measles long after, but that later confusion, especially in the second half of the 18th century, was with scarlatina[1]. The entry of measles is in

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[1] John Graunt, *Natural and Political Observations upon the Bills of Mortality*, London, 1662, says: "The original entries in the Hall books were as exact in the

the bills from the first, apart from that of "flox and smallpox:"

Year	Measles deaths	Smallpox deaths	Year	Measles deaths	Smallpox deaths
1629	42	72	1650	33	184
1630	2	40	1651	33	525
1631	3	58	1652	62	1279
1632	80	531	1653	8	139
1633	21	72	1654	52	832
1634	33	1354	1655	11	1294
1635	27	293	1656	153	823
1636	12	127	1657	15	835
1647	5	139	1658	80	409
1648	92	401	1659	6	1523
1649	3	1190	1660	74	354

In the great epidemic of smallpox in 1628, the year before the bills begin, Thomas Alured wrote to Sir John Coke that his house in London had been visited "once with the measles and twice with the smallpox, though I thank God we are now free; and I know not how many households have run the same hazard[1]." In the year 1656, which has the highest total in the above table, two cases of measles are mentioned in a letter of 31st May: "Young Sir Charles Sedley is at this time very sick of a feaver and the meazells, of which Sir William dyed"—Charles Sedley being then in his seventeenth year[2]. An instance parallel to that of 1628, of measles and smallpox co-existing in the same household, occurred in the royal palace at Whitehall in December, 1660. The princess of Orange, sister of the king, died of smallpox on the 23rd; on that day, or a day or two before, her sister the princess Henrietta, who had come from France on a visit with the queen-mother, Henrietta Maria, removed from Whitehall to St James's, "for fear of infection." After a few days she embarked on board the 'London' at Portsmouth to return to France, but the ship had to come to anchor again owing to the princess being attacked with "the measles." Her illness, which delayed the sailing of the vessel until the 24th of January, 1661, is uniformly spoken of as the measles in the various letters which make mention of

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very first year [he probably means 1629, which is the first year of his own extracts from them, but the classification of deaths began in 1604] as to all particulars, as now; and the specifying of casualties and diseases was probably more." The searchers, he explains, were in many cases able to report the opinions of the physicians, receiving the same from the friends of the deceased; while for certain causes of death, among which he includes smallpox, "their own senses are sufficient."

[1] *Cal. Coke MSS.* (Hist. MSS. Commis.) I. 21 June, 1628.

[2] Sutherland Letters, in *Rep. Hist. MSS. Com.* V. 152.

it[1]. In that year, and in several of the next ten years, the measles deaths in London reached a considerable total:

Year	Measles deaths	Year	Measles deaths
1661	188	1666	3
1662	20	1667	83
1663	42	1668	200
1664	311	1669	15
1665	7	1670	295

The epidemic of 1670 is the subject of a description by Sydenham, the diagnostic points of which were doubtless those current at the time.

Sydenham's description of Measles in London, 1670 and 1674.

Sydenham's account of the epidemic of 1670 is full enough to leave no doubt that it was measles of the ordinary kind; the details, indeed, are as minute for all essential points as they would be in a modern text-book[2]:

> Measles, he says, is a disease mainly of young children (*infantes*), and is apt to run through all that are under one roof. It begins with a rigor, followed by heats and chills during the first day. On the second day there is fever, with intense malaise, thirst, loss of appetite, white tongue (not actually dry), slight cough, heaviness of the head and eyes, and constant drowsiness. In most cases a humour distils from the nose and eyes, the effusion or suffusion of tears being the most certain sign of sickening for measles, more certain indeed than the exanthem. The child sneezes as if it had taken cold, the eyelids swell, there may be vomiting, more usually there are loose green stools (especially during dentition), and there is excessive fretfulness. On the fourth or fifth day small red maculae, like fleabites, begin to appear on the forehead and the rest of the face, which coalesce, as they continue to come out in increasing numbers, so as to form racemose clusters. These maculae will be found by the touch to be slightly elevated, although they seem level to the eye. On the trunk and limbs, to which they gradually extend, they are not elevated. About the sixth day the maculae begin to roughen and scale, from the face downwards, and by the eighth day are scarcely discernible anywhere. On the ninth day the whole body is as if dusted with bran. The common people say that the spots had "turned inwards," by which they mean that, if it had been smallpox, they would have remained out longer, and have proceeded to suppuration or maturation. The rash having thus "gone in," there is an access of fever, attended with laboured breathing and cough, the latter being so incessant as to keep the children from sleep day or night. If they had been treated by the heating regimen, they are apt to have the chest troubles

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[1] *Cal. State Papers, Domestic. Charles II.* s. d. It appears from the *Pyretologia* by Drage, of Hitchin (1665), that the natural history of measles must have been familiar, for he mentions that its incubation period was from fourteen to fifteen days: p. 20.

[2] *Obs. Med.* 3rd ed. (1675), Bk. IV. chap. 5.

pass into peripneumonia, by which complication measles becomes more destructive than smallpox itself, although there is no danger in it if it be rightly treated. When peripneumonia threatens, the patient should be bled, even if it be a tender infant. Diarrhoea, which sometimes continues for weeks after an attack of measles, may be cut short by blood-letting, and so also may whooping-cough.

This epidemic, says Sydenham, began in January, and was almost ended in July, which agrees exactly with the rise and decline of measles deaths in the weekly bills of the Parish Clerks.

His account of the epidemic of 1674 is still more important to be set beside the figures in the bills; for the type, according to Sydenham, was anomalous, and the total of deaths entered by the Parish Clerks (795) is exceptionally large. Like the epidemic four years before, it began in January, came to a height about the vernal equinox, and was nearly over at the summer solstice[1].

Weekly Deaths in London in the first six months of 1674.
(*Epidemic of Measles.*)

1674

Week ending		Fever	Smallpox	Griping in the guts	Measles	Convulsions	Teeth	Consumption	All causes
Jan.	6	35	13	35	0	37	15	78	332
	13	35	19	32	1	32	22	65	369
	20	37	12	29	0	39	18	65	327
	27	34	15	38	0	38	17	68	354
Feb.	3	32	23	39	7	45	26	75	418
	10	47	18	35	4	48	35	86	430
	17	55	21	46	15	70	38	98	537
	24	62	17	45	28	54	44	97	510
March	3	58	31	28	59	48	49	87	547
	10	55	22	31	87	85	58	122	688
	17	63	15	46	95	79	57	113	695
	24	59	23	44	65	57	39	96	568
	31	51	19	49	60	77	51	105	622
April	7	44	13	40	43	65	48	118	547
	14	53	20	32	31	60	50	98	535
	21	40	17	43	38	55	42	106	517
	28	50	17	44	53	67	34	87	520
May	5	51	31	28	30	56	24	75	452
	12	38	26	47	30	54	37	79	479
	19	50	35	33	26	47	28	82	461
	26	67	27	33	13	45	28	63	415
June	2	48	24	28	14	41	26	77	365
	9	35	26	38	15	48	27	66	369
	16	64	34	38	19	38	22	70	419
	23	34	33	34	9	52	15	71	368
	30	37	39	30	9	30	21	59	343

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[1] Sydenham, *Obs. Med.* 1675, v. 3. "Morbilli anni 1674." It entered almost every household, as on the last occasion, attacking infants more especially. It had

It will be seen that the highest weekly mortality from measles is only 95, in the week ending 17th May. But in that week the deaths from all causes reached the enormous total of 695, which was nearly three hundred above the weekly average of the time. This appears to have been the epidemic of measles which Morton declares to have destroyed three hundred in a week, a mode of reckoning which would claim for measles, directly or indirectly, the excess of mortality from all causes during the height of the epidemic[1].

These high weekly mortalities in February, March, April and May are remarkable for the season of the year. Usually when the weekly figures reach six or seven hundred, it is in a hot autumn, and the cause is infantile diarrhoea, represented in the bills by the excessive number of deaths from "griping in the guts" and "convulsions;" more rarely, and then only for three or four weeks, correspondingly high figures are reached in a season of influenza. But in this case the epidemic measles is the only relevant thing. The measles deaths by themselves do by no means account for the enormous weekly totals; but two of the three columns of figures which help them, and indeed keep pace with the rise of the measles deaths, namely, "convulsions" and "teeth," are infantile deaths obviously related to the prevailing epidemic; while the third column, "consumption," which contributes most of all, did not in the London

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some points of difference from the measles of 1670. The rash was less uniformly on the fourth day, now sooner, now later; it would come on the arms or trunk before the face; nor was it followed by the branny powdering which was as obvious in the measles of 1670 as it was usual to see it after scarlatina. Along with these anomalies of the rash, the consecutive fever and peripneumonia were also more severe, and a more frequent cause of death. But in the principal characters of measles the disease of 1674 was the same as that of 1670, and called for no fresh description. Among Sydenham's patients were the children of the Countess of Salisbury, who all took measles in turn, and all passed through the attack and its sequelae without danger, under a particular regimen which is detailed. It is of great interest to see how this season of anomalous measles looks in the weekly bills, as in the above table.

[1] Richard Morton, M.D. *Pyretologia.* 2 vols. Lond. 1692–94, I. 427. He places it in the year 1672 and in the six months of autumn and winter; and in another place (II. 71), where he cites clinical cases, he again gives the year 1672 as that in which measles "epidemice Londini publice grassabantur." He compares the epidemic to a *pestis mitior*, and says that the disease had never been epidemic again to the date of his writing (1692–94). It is tolerably clear that, in writing twenty years after, he had forgotten the year and even the season—not the only error in dates in his work. Sydenham's account of the great measles epidemic of spring and summer, 1674, was published the year after, and is exactly borne out by the weekly bills of mortality. Morton's obvious mistake of the date is the subject of a refutation four pages long by Thomas Dickson, M.D., F.R.S., physician to the London Hospital, in *Med. Obs. and Inquiries*, IV. (1771), p. 266.

bills mean pulmonary consumption exclusively, but also the wasting or marasmus which followed or attended acute fevers in general, and was specially apt to follow or attend measles[1].

Sydenham gives no indication that the spring of 1674 was unusually productive of pneumonia or pleurisy among adults; the winter, he says, was unusually warm, the weather in spring turning colder. But, as to the measles, he does say that the epidemic was anomalous or irregular; while both he and Morton refer the fatalities more especially to the sequelae of measles,—to the "suffocation" of infants and children by the bronchitis or peripneumonia, or to "angina," as Morton says, meaning perhaps the same as in Scotland was understood by "closing" in infants. Measles itself was a milder disease than smallpox, according to the experience of all times; and yet, by its sequelae (bronchitis, capillary bronchitis and pneumonia, including what Morton calls "angina," and excluding, for the present, whooping-cough), it raised the weekly mortalities of February, March, April and May, 1674, to far above the average. Sydenham said, with reference to the much milder epidemic of 1670, that these after-effects of measles "destroyed more than even smallpox itself" (*quae* [*peripneumonia*] *plures jugulat quam aut variolae ipsae*). We shall not correctly understand the part played by measles among the infective maladies of children unless we keep that grand character of it in mind—that its effects upon the mortality of infancy and childhood are only in part expressed by the deaths actually appearing under its name.

The London bills for 1674 afford us the opportunity of testing Sydenham's paradox that measles, by its after-effects, destroyed more than smallpox itself. The epidemic of measles was nearly over in June; and immediately thereafter an epidemic of smallpox began (not of course from zero but from the usual level of the disease), which reached a maximum of 122

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[1] Fothergill (*Gentleman's Magazine*, Dec. 1751) says, in a criticism of the Bills of Mortality: "If the body is emaciated, which may happen even from an acute fever, 'tis enough for them to place it to the article of consumption." And of course they would do so the more readily if the acute fever, say measles, were past, and its sequelae had been the cause of death. Referring to Kidderminster in 1756, Johnstone says: "Measles at this time went through our town and neighbourhood: vast numbers of children died tabid." It is to be remarked that the fever column is augmented but little during the measles of 1674, a fact which shows that the inflammatory causes of death, such as capillary bronchitis and pneumonia (specially recorded by Sydenham for this epidemic), were more apt to be entered under "consumption" than under "fevers."

deaths in the week ending 20th October. The second half of the year was thus marked by a sharp outburst of smallpox, as the first half was marked by a sharp outburst of measles; and those two diseases were the only epidemic maladies that gave character to the respective seasons, each being in its proper season, according to Sydenham—measles in the spring, smallpox in the autumn. Although the measles deaths were only 795 for the whole year, the smallpox deaths being 2507, yet the former epidemic was attended by so great an excess of deaths under various other heads that the half of the year in which it fell was far more unhealthy than the succeeding half in which the smallpox mainly fell, the weekly average of the first six months having been 468 deaths, and of the second six months 349 deaths. The following table shows the weekly mortalities for the second half of the year; it will be observed that no column of figures keeps pace with the rise of the smallpox deaths, as three columns had kept pace with the rise of the measles deaths in the first six months of the year.

Weekly Deaths in London in the last six months of 1674.
(*Epidemic of Smallpox.*)

1674

Week ending		Fever	Smallpox	Griping in the guts	Measles	Convulsions	Teeth	Consumption	All causes
July	7	31	44	35	9	44	24	69	351
	14	38	55	34	5	37	17	54	353
	21	40	71	47	6	42	25	56	395
	28	43	71	37	3	49	18	48	367
Aug.	4	38	68	39	6	31	23	47	347
	11	33	66	48	–	18	8	45	324
	18	49	86	41	1	26	20	48	374
	25	35	85	23	3	32	10	46	328
Sept.	1	60	96	41	–	32	18	57	414
	8	32	99	48	3	22	16	32	374
	15	28	102	38	2	30	19	55	362
	22	27	72	32	3	29	11	57	327
	29	39	81	34	2	41	9	53	358
Oct.	6	37	98	29	–	34	10	63	391
	13	36	75	25	–	35	17	49	311
	20	42	122	35	1	34	10	68	402
	27	24	75	36	–	38	15	45	294
Nov.	3	34	83	21	–	30	11	41	322
	10	30	81	15	–	31	12	49	321
	17	31	70	16	–	24	10	58	304
	24	35	70	28	–	38	14	57	344
Dec.	1	33	85	29	–	32	14	68	378
	8	33	66	28	–	36	11	53	327
	15	29	61	26	–	39	16	49	339
	22	34	68	21	–	32	11	52	335
	29	41	41	19	–	33	7	74	337

The total of deaths by smallpox for the year, 2507 was the highest since the bills began, and remained the highest until 1681. It is open to us to suppose that it would not have been so high but for the epidemic of measles preceding. The measles not only made the first half of the year far more deadly than the second, within which most of the smallpox fell, but its effects may have aided the high mortality of smallpox itself, according to the experience of later times that infants and young children recovering from measles in a greatly weakened condition fell an easier prey to smallpox coming after[1].

Morton passes from the fatal epidemic of 1674 (or, as he says, 1672), with the remark that the malady had not been epidemic again in London from that time until the date of his writing, 1692–94, a period of nearly twenty years; and that is on the whole borne out by the London bills and by Sydenham's records so far as they extend. From 1687 to 1700, inclusive, the London bills grouped the measles deaths along with the deaths from smallpox, under the heading, "Flox, Smallpox and Measles"; in 1701 the total of measles, 4 deaths, is given as a separate item in the same bracket with smallpox; and in 1702 the heading of "Measles," is restored to the place in the alphabetical list which it had held, except for that unaccountable break, from the beginning of the published bills in 1629. The following are the annual totals from and including the great epidemic of 1674:

Year	Death from measles	Year	Death from measles
1674	795	1681	121
1675	1	1682	50
1676	83	1683	39
1677	87	1684	6
1678	93	1685	197
1679	117	1686	25
1680	49		

Thus for a good many years after the general prevalence of measles in 1674 the deaths from it in London averaged only about one and a half in the week, while in no year until 1705–6 is there an epidemic comparable to that of 1674. It is clear that the severe epidemics of measles came at first at very long intervals, and that the years between had a very moderate mortality from that disease.

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[1] See Watson's account of smallpox following measles at the Foundling Hospital, *supra*, p. 550.

Measles in the 18th century.

There is hardly a reference to be found to measles in medical or other writings until the annual accounts of the public health at Ripon, York, Plymouth, etc. in the third decade of the 18th century. The annual deaths from it in London, according to the bills, were as follows, from 1701, when the disease was restored to its separate place in the classification:

Year	Measles deaths	Year	Measles deaths	Year	Measles deaths
1701	4	1715	30	1728	82
1702	27	1716	270	1729	41
1703	51	1717	35	1730	311
1704	12	1718	492	1731	102
1705	319	1719	243	1732	30
1706	361	1720	213	1733	605
1707	37	1721	238	1734	20
1708	126	1722	114	1735	10
1709	89	1723	231	1736	169
1710	181	1724	118	1737	127
1711	97	1725	70	1738	216
1712	77	1726	256	1739	326
1713	61	1727	72	174	46
1714	139				

The high mortalities of 1705 and 1706 belonged to one continuous epidemic from October, 1705, to April, 1706 (Sir David Hamilton says that smallpox was common in London in July, 1705, but the deaths in the bills are not excessive). The epidemic followed a great prevalence of the autumnal diarrhoea of infants, so that it is probable the high mortality was due as much to a greater fatality of cases from the antecedent weakening, as to an unusual number of cases[1]. The following were the weekly deaths in a population about one-sixth that of London now:

1705—1706

Week ending		Measles deaths	Week ending		Measles deaths
Oct.	16	9	Jan.	15	28
	23	9		22	20
	30	12		29	18
Nov.	6	10	Feb.	5	27
	13	30		12	11
	20	34		19	26
	27	29		26	28
Dec.	4	37	Mar.	5	10
	11	46		12	10
	18	44		19	9
	25	22		26	13
Jan.	1	35	Apr.	2	9
	8	33		9	9

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[1] It may have been this high mortality that Dover had in mind when he wrote, in

The unusually large mortalities from measles in 1718–19 and in 1733 were again associated with a "constitution" otherwise sickly. The epidemic in the latter year, from the middle of March to the end of July, which had a maximum of 47 deaths in each of the two middle weeks of May, followed close upon a severe influenza. Like the epidemic of 1674, it was attended by a high mortality from other causes, especially "convulsions" and "consumption"; and, as the bills had now begun to give the ages at death, it is no longer doubtful, or merely conjectural, that the great excess of deaths under these and other heads was really among infants, or that a rise in "consumption" at that time of the year meant an increase in the wasting diseases of infancy. This was a period when any epidemic malady among London children was sure to go hard with many of them, the period, namely, when spirit drinking, besides ruining the health of the parents, rendered them, in the opinion of the College of Physicians, "too often the cause of weak, feeble and distempered children[1]."

The intervals between epidemics of measles in London having been so considerable as the table shows, it is not surprising to find but casual mention of the disease in the chronicles of Wintringham, Hillary, and Huxham for England, of Rogers, O'Connell and Rutty for Ireland, and of the Edinburgh annalists. Wintringham, of York, whose annals extend from 1715 to 1730, records an epidemic of measles in 1721, which began in April and lasted all the summer, being for the most part of a bad type, attended with continual cough and inflammation of the lungs. Hillary, of Ripon, enters measles in 1726, "very common but mild," autumn and winter being the season of it. Wintringham briefly mentions the same epidemic. Huxham of Plymouth has an entry of measles in the first year of his annals, 1727, in the month of July, followed by whooping-cough in December. Wintringham again enters measles at York in 1730 in the company of smallpox. In the annual accounts of the disease at Edinburgh, for a series of years beginning with 1731, measles is first mentioned in 1735[2]. The epidemic

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1733: "I do not remember I ever heard of anyone's dying of this disease [measles] till about twenty-five years since; but of late, by the help of Gascoin's powder and bezoartic bolusses, together with blisters and a hot regimen, the blood is so highly inflamed and the fever encreased to that degree that it is become equally mortal with the smallpox." *Physician's Legacy*, 1733, p. 116.

[1] Memorial to the House of Commons, *supra*, p. 84.

[2] *Edin. Med. Essays and Obs.* v. 26.

began in June and became universal in December: "The progress of these measles along the west road of England towards Edinburgh was very remarkable, for they could be traced from village to village; and it was singular that the first person in Edinburgh who was seized with them was a lady in childbed, who saw nobody but her nurse and a friend who lived in the house with her"—an argument, apparently, for the doctrine of an epidemic "morbillous" constitution of the air. Five years after, we obtain the mortality statistics of Edinburgh, in the two great years of scarcity, typhus fever and sicknesses of all kinds, the years 1740 and 1741: in those two years measles must have been as general as smallpox if it were half as mortal, for the deaths set down to it in each year are 110 and 112, as compared with 274 and 206 from the more usual infantile infection. In like manner the second year of the disastrous epidemic of typhus in 1741–42, had the highest total of measles deaths in London until the great epidemic of 1808. While the high mortality of that year was due to special causes, it is at the same time clear from the following table that measles had not yet become a steady or perennial cause of death to the infancy of the capital:

Year	Measles deaths	Year	Measles deaths	Year	Measles deaths
1741	42	1761	394	1781	201
1742	981	1762	122	1782	170
1743	17	1763	610	1783	185
1744	5	1764	65	1784	29
1745	14	1765	54	1785	20
1746	250	1766	482	1786	793*
1747	81	1767	80	1787	84
1748	10	1768	409	1788	55
1749	106	1769	90	1789	534
1750	321	1770	325	1790	119
1751	21	1771	115	1791	156
1752	111	1772	211	1792	450
1753	253	1773	199	1793	248
1754	12	1774	121	1794	172
1755	423	1775	283	1795	328
1756	156	1776	153	1796	307
1757	24	1777	145	1797	222
1758	696	1778	388	1798	196
1759	316	1779	99	1799	223
1760	175	1780	272	1800	395

* Pronounced by Sims to have been wholly scarlatina, and by Willan to have been in part that disease.

The considerable epidemic of 1755 is thus referred to by Fothergill in his monthly notes:

May: the measles more common than for some years, adults, who had not before had it, rarely escaping. *June:* measles common, smallpox rare. *September and October:* no epidemic disease but measles; few perished in proportion to all who took it[1]. The epidemic of 1758 was more fatal, but Fothergill's notes are not continued to that year. The elder Heberden says that measles was remarkably epidemical (in London) in 1753, which year has only 253 deaths in the bills, whereas the year 1755 has 423 deaths and the year 1758 has 696; but, as he implies that the type was mild, there would have been a multitude of cases to produce that number of deaths. It was a peculiarity of that epidemic, he says, that the cough preceded the outbreak of measles by seven or eight days, whereas it was usually but two or three days in advance of the eruption[2].

At that period there would have been an epidemic of measles in London every other year, or once in three years, with a fatality from the direct effects seldom more than a sixth part that of an epidemic of smallpox. A London writer some twenty years after said that few escaped measles in infancy or childhood, while the deaths put down to it were only a tenth part of those due to smallpox on an average of years[3]. The proportion of measles deaths to smallpox deaths was nearly the same in Manchester for twenty years from 1754 to 1774, according to Percival's table of the burials in the register of the Collegiate Church where most of the poorer class were buried[4]:

Annual averages of Burials from Measles etc. at the Collegiate Church, Manchester.

Period	Measles	Smallpox	All deaths under two	Deaths at all ages	Baptisms
1754–58	21	64	209	651	678
1759–63*	10·6	95	213	639	731
1764–69	9·6	98	229	659	827
1770–74	21·6	102	242	651	1062

* Omitting the year 1760.

The ages of those who died of measles "in six years from 1768 to 1774," to the number of 91, were as follows:

Total	3 mo.	-6 mo.	-12 mo.	-2 years	-3	-4	-5	-10	-20	-30
91	2	3	10	31	25	7	9	2	1	1

Fifty were males, forty-one females—a preponderance of males which is according to rule. Of the whole ninety-one, no fewer than fifty-one died in June of the several years.

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[1] Monthly reports in the *Gentleman's Magazine*, under the dates.

[2] Heberden's paper on measles in *Trans. Col. Phys.* III. (1785), pp. 389, 395.

[3] W. Black, M.D., *Obs. Med. and Political on the Smallpox, &c.* London, 1781, p. 207: "Few escape measles in infancy or childhood, and as we find one-tenth fewer to die of measles than of smallpox, etc.... In their future consequences, measles, especially in cities, are not without hazard, and are not unfrequently followed by hecticks."

[4] Percival, in *Med. Obs. and Inquiries*, V. (1776), p. 282.

In the smaller and more healthy towns, such as Northampton, the epidemics of measles came at long intervals and caused but few deaths :

Infantile Causes of Death, All Saints, Northampton[1].

Year	Measles	Whooping-cough	Convulsions	Teething
1742	3	1	10	8
1743	–	–	21	2
1744	–	3	14	4
1745	–	–	22	7
1746	–	3	19	3
1747	7	–	29	–
1748	–	–	24	4
1749	–	6	15	4
1750	1	–	17	1
1751	–	–	14	6
1752	–	1	13	6
1753 1754	not published			
1755	–	1	8	1
1756	–	2	10	2
1757	1	1	28	4

In the parish of Holy Cross, a suburb of Shrewsbury, there were 4 deaths from measles in the ten years 1750-60, and 15 in the ten years 1760-70, the smallpox deaths having been respectively 33 and 46. Ackworth, in Yorkshire, may represent the country parishes. It had no deaths from measles from 1747 to 1757, two deaths from 1757 to 1767. At Kilmarnock during thirty-six years from 1728 to 1764, there were 93 deaths from measles, 52 of them in the period 1747-52, and only 11 in the next twelve years. Sims, of Tyrone, having described an epidemic of smallpox which desolated the close of 1766 and spring of 1767 with unheard of havoc (it had been out of the country for some years), mentions farther that an epidemic of measles followed immediately: "Before the close of the summer solstice the measles sprang up with a most luxuriant growth," and was followed in harvest by whooping-cough.

Wherever we have the means of comparison by figures, it appears that measles caused by its direct fatality not more than a sixth part of the deaths by smallpox in Britain generally. But in the colonies, where an epidemic of smallpox was a rare event of the great seaports, and as much an affair of adults as of children, measles seems to have been more fatal, dividing with diphtheria or scarlatina the great bulk of the infectious mortality of childhood. Thus Webster enters under 1772: "In this year the measles appeared in all parts of America with unusual mortality. In Charleston died 800 or 900 children"; and under 1773: "In America the measles finished its course and was followed by disorders in the throat"—especially in 1775[2]. It is

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[1] Compiled from the tables in the *Gentleman's Magazine*, 1742-57. All Saints parish contained more than half the population.

[2] Pearce, writing from St Croix, West Indies, 12 Oct. 1782, to Lettsom (*Memoirs*, III. 429), says the measles had been "very rife and fatal" there.

only among the children of public institutions in England that we find in the corresponding period a similar predominance of measles and scarlatina over smallpox. In the Infirmary Books of the Foundling Hospital the more general outbreaks of smallpox cease after 1765, while epidemics of measles, extending to perhaps a third or more of the inmates, as well as great epidemics of scarlatina, begin after that date to be common[1].

In the Infirmary Book from which the following extracts are taken, the number of deaths is not stated. The number of children in the Hospital was 312 in 1763, 368 in 1766 and 438 in 1768.

1763. Before the date of the Infirmary Book, Watson records an epidemic of putrid measles from 21 April to 9 June, 1763, which attacked 180 and caused 19 immediate deaths.

Nov. 19. Nine in the infirmary with "morbillous fever"; many cases of "fever" until the 17th December.

1766. May to July. Many entries in the book; Watson says: "Seventy-four had benign measles, and all recovered."

1768. Great epidemic, May to July; one hundred and twelve in the infirmary with measles on June 4th; Watson gives the total cases at 139, of which 6 were fatal.

1773. Nov. and Dec. Great epidemic: maximum of 130 cases of measles in the infirmary on 27th November. Next week there were 40 with measles, and 90 convalescing therefrom.

1774. May. A slight outbreak (8 cases at one time).

(*Records from* 1776–1782 *not seen.*)

1783. March and April. Great epidemic: maximum number of cases in the infirmary with measles 94, on March 22nd.

1784. June. Eleven cases of measles at once.

1786. March and April. Maximum on April 5th—measles 47, recovering from measles 19.

The records from 1789 to 1805 have not been seen, but Willan gives the following dates and numbers, on the information of Dr Stanger, physician to the charity[2].

1794. 28 had measles, all recovered.
1798. 69 had measles, 6 girls died.
1800. 66 had measles, 4 boys died.
1802. 8 had measles, one died.

The general testimony in the last quarter of the 18th century is that measles, if a common affection, was not usually a severe one. Heysham, of Carlisle, says that measles came thither in 1786 from the south-west of Northumberland, "where, I am informed, they proved very fatal"; the epidemic began at Carlisle in August, and continued very general until January, 1787, but extremely mild and favourable, only 28 having died (26 under five years, 2 from five to ten), out of "some six or seven hundred, I suppose." The previous epidemic of measles

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[1] MS. Apothecary's Books at the Foundling Hospital.

[2] R. Willan, M.D., *On Cutaneous Diseases.* Vol. I. 1808, p. 244.

at Carlisle in 1780 (mortality not stated), had followed a most fatal epidemic of smallpox in 1779; and although the epidemic of mild measles in 1786 did not follow a great epidemic of smallpox, it followed a high and steady annual average of deaths of infants and young children from that cause year after year[1]. In both years of the measles at Carlisle, there were no deaths from smallpox. In like manner at Leeds, in 1790, measles followed smallpox, and was extremely mild; Lucas wrote of it, "I have not seen one instance of a fatal termination[2]." This was the time (1785) when Heberden said of the disease in London, just as Willis, Harris and others had said of it and of smallpox together a century before: "The measles being usually attended with very little danger, it is not often that a physician is employed in this distemper."

Increasing mortality from Measles at the end of the 18th century.

There were epidemics of measles with high mortality in the 17th and 18th centuries, occurring in special circumstances of time and place, of which instances have been given. But in general the position of measles was not then so high among the causes of death in infancy and childhood as it afterwards became. It is not easy to demonstrate the exact proportions by figures, even for London; the bills of the Parish Clerks are less trustworthy for measles than for smallpox, for the reason that deaths from scarlatina were probably included among the former (see under Scarlatina). For example, the ratio of 1·10 per cent. measles deaths for the ten years 1781–90 in the following table should be only 0·70 if the 793 deaths in 1786, supposed scarlatinal, be left out. But, taking the bills as they stand, they show an increasing ratio of measles (as well as of whooping-cough) among the deaths from all causes towards the end of the 18th century.

Percentage of Measles and Whooping-cough in all London deaths, 1731–1830.

Ten-year periods	Share of measles	Share of whooping-cough
1731–40	0·70	0·41
1741–50	0·68	0·40
1751–60	1·15	1·03
1761–70	1·11	1·12
1771–80	0·93	1·66
1781–90	1·10	1·32
1791–1800	1·34	1·97
1801–10	3·11	3·14
1811–20	3·52	3·49
1821–30	3·17	3·13

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[1] Heysham, u. s., p. 538.

[2] James Lucas, "On Measles." *Lond. Med. Journ.* XI. 325, dated 22 Aug. 1790.

During same period, the ratio of deaths from all causes under two years of age had decreased, while the ratio of deaths from two to five, and at all ages above five, had increased as in the following table, also compiled from the London bills beginning with the year 1728 when the ages at death were first published.

Ratios of Deaths from all causes under two years, from two to five, and above five, London, 1728–1830.

Period	Total deaths	Ratio under Two years	Ratio from Two to Five	Ratio of all ages above Five
1728–30 (3 yrs.)	84,293	36·7	8·7	54·6
1731–40	246,925	38·6	8·9	52·5
1741–50	254,717	33·6	7·9	58·5
1751–60	204,617	30·9	9·3	59·8
1761–70	234,412	34·1	9·1	56·8
1771–80	214,605	34·4	9·6	56·0
1781–90	192,690	32·5	9·5	58·0
1791–1800	196,801	31·8	10·9	57·3
1801–10	185,823	29·3	11·5	59·2
1811–20	190,768	27·7	9·8	62·5
1821–30	209,094	28·0	9·7	62·3

Thus, while measles (with whooping-cough) was usurping, so to speak, a larger share of all the deaths, the two first years of life were claiming a smaller share of the deaths from all causes as the probability of life was improving. The saving of infant life was due to various things, but especially due to the decline of smallpox, as described in another chapter. We may now turn to consider, by a less abstract method, the increase of measles mortality from the last years of the 18th century.

In Willan's periodical reports of the prevailing diseases of London[1], scarlatina declined in 1795 and became sporadic, after having been extremely fatal for a long period, while measles and smallpox began to extend about the end of that year, the former being for the most part mild in its symptoms and favourable in its termination, the latter often confluent, and fatal to children. The report for March and April, 1796, is that measles had become more severe, and had been followed by obstinate coughs; for May, that "smallpox and measles have prevailed more during this spring than has been known for many years past." However, it was smallpox that occasioned the larger share of the deaths among infants and children. The

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[1] *Reports on the Diseases of London*, 1796–1800. Lond. 1801, pp. 2, 13, 18, 32, 229.

next general view that Willan gives us of the relative importance of measles among the infectious diseases is under Oct.–Nov. 1799: "The measles, though extensively diffused, have continued mild and moderate. The scarlet fever has increased, since the last report, both in extent and in the violence of its symptoms; but the contagious malignant fever [typhus] has been the most frequent, as well as the most fatal, of all acute diseases." There is little sign of fatal measles in the London bills during the years of distress, 1799–1801; but we hear of it in Scotland and Ireland, where there was probably less scarlatina. An Edinburgh observer of the prevailing diseases says that "several hundreds" died of measles there in the winter of 1799[1]. In the Irish emigration to America, which took one of its periodic starts owing to the repressive measures following the rebellion of 1798 and the union with England, measles appears to have been the fatal form of infection among the children on board ship. A medical letter from Philadelphia, 10 December, 1801, says that measles had been imported to Newcastle and Wilmington in the summer of 1801 by some vessels from Ireland, on board which a great many children died during the voyage; the epidemic at length reached Philadelphia and had become general throughout the city[2]. At Whitehaven large numbers of infants were attended in measles from the Dispensary in 1796 and 1799, but the deaths (2 in 202 cases, and 2 in 266 cases) are probably only a few that came to the knowledge of the visiting physician. An epidemic at Uxbridge, Middlesex, in the winter of 1801–2 was certainly malignant or fatal more than ordinary, whatever its anomalous type may have meant.

The epidemic began in September, and was at first of so mild a type as to need no medical assistance. Towards November the cases increased in number and severity, but still, says the narrator, "I believe every case terminated favourably, not in my practice only, but in that of other gentlemen also." Towards the middle of November, the attacks were more sudden and more violent while they lasted, and were soon over either in death or recovery. In some the eyes became all at once as red as blood, the pulse full, quick and hard, the cough incessant, with a rattling noise in the throat and quick laboured breathing, the skin hot and parched.

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[1] John Roberton, in *Med. and Phys. Journ.* XIX. 185. Measles seems to have been more usual than scarlatina in Scotland as well as in Ireland. In the accounts of the several parishes written for the *Statistical Account*, about 1791–99, measles is often mentioned (and would appear at that time to have been more usual in country districts than smallpox), while hardly anything is said of scarlatina under that name, and not much of sore-throat.

[2] *Med. and Phys. Journ.* VII. (1802), p. 316.

"Another peculiarity in this epidemic was that the cuticle in many children did not separate after the disappearance of the eruption, and in several others that I particularly noticed, it came off in large flakes instead of branny scales: and the appearance of the rash in others assumed so striking a resemblance to the scarlet fever that, had it not been for the violent cough and other measly symptoms, many such cases occurring singly might, upon a superficial view, have been considered and treated as that disorder." The various forms occurred in the same family; thus, of four children, one had typical measles, ending in a branny scurf, two others had the sneezing and the watery inflamed eyes, but the eruption in the form of an universal red fiery rash, after which the skin peeled in large flakes, while the fourth had the disease of a low typhoid type and recovered with difficulty. The epidemic "continued its destructive career" through December and January, after which the type became as mild as it had been at first. If the author had not discussed the diagnosis as between measles and scarlatina, deciding in favour of the former, one might have suspected that there were cases of both. But even the sphacelation that followed the application of blisters, the pemphigus-like eruption turning gangrenous, and the petechiae, were signs of malignancy in more than one of the exanthematous fevers. The sequelae of this epidemic of measles were as anomalous as the symptoms themselves; instead of the inflamed eyes, and the distressing cough (sometimes ending in consumption) there were aphthous fever and dysenteric purging[1].

The deaths in the London bills for the first twelve years of the century will be found in the table on p. 655. We find the measles deaths for the first time equalling the smallpox deaths in 1804, and in 1808 surpassing them, and we may take it that the deaths so entered were almost wholly of measles proper. The epidemic of measles in 1807–8 was, in fact, a great and clearly defined event in British epidemiology, the first of a series of epidemics in which that disease established not only its equality with smallpox as a cause of infantile deaths but even its supremacy over the latter. It would appear, also, to have been more malignant than the scarlatina that coexisted with it. Thus, Bateman, of London, at the outset of the great measles epidemic of 1807–8, says: "The most prominent acute disorders have been eruptive fevers and particularly the measles, which during October and November have been very prevalent, and, when occurring in young children, have proved very fatal by terminating in violent inflammation of the organs of respiration...The scarlatina was generally mild, presenting the eruption with a slight sore-throat[2]."

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[1] "Observations on Measles." By Mr Edlin, surgeon, Uxbridge. *Med. and Phys. Journ.* VIII. (July–Dec. 1802), p. 28. An earlier epidemic of anomalous eruptive fever ("dark coloured eruption of the neck and breast which spread at length over the whole body") was described for Uxbridge and its vicinity in the summer and autumn of 1799, in an essay reviewed in *British Critic*, XV. 435.

[2] T. Bateman, M.D., *Report on the Diseases of London*, 1804–16. Lond. 1819, p. 90-91.

Other accounts the epidemic in London show it to have been of the type which Sydenham, in 1674, called anomalous or malignant.

The epidemic began in October–November, 1807, and was remarked as unusually fatal[1].

Several children in the same family had fallen victims to it. Some cases were fatal in a few days, either from the intensity of the fever or from pneumonic complication. "But when these symptoms have been less violent, and the patient has passed without much alarm through the different stages of the disorder, and even after all apprehension of danger in the mind of parents or friends has been dismissed, a continuance or recurrence of pneumonic symptoms has laid a foundation for phthisis pulmonalis." In some cases attended from the Westminster Dispensary, death followed from effusion into the chest or from membranous inflammation of the trachea. Numbers who recovered from the measles were afterwards affected with debility, cough, emaciation and oedematous swellings of the face and extremities which proved very difficult to remove. These particulars are given mostly for the end of 1807, but it is under the year 1808 that the great rise in the measles deaths appears in the London bills of mortality.

Besides these accounts for London, we have some details of the same epidemic at Edinburgh and Aberdeen and exact figures for Glasgow. It began at Edinburgh in the winter of 1807, and at Aberdeen (as at Glasgow) in the spring of 1808. At both places it was remarked as unusually fatal, chiefly from a complication of bowel complaint in children and from pulmonary affections in adults.

The Aberdeen observer says that in town (the disease being milder in the country) there were troublesome symptoms in almost every case—a violent pain in the belly, frequently accompanied with diarrhoea (and even with vomiting), and with the dysenteric symptoms of tenesmus and mucus in the stools. This bowel complaint usually lasted three or four days, and wasted the patients remarkably. There was also the usual catarrh with violent tickling cough, and, after the acute attack, a tendency to sudden dyspnoea and "fatal coughs." In some the convalescence was lingering and very distressing to the patient: "it consists in a slow kind of fever, with evening exacerbations[2]."

The observers at Edinburgh and Aberdeen agree that the epidemic was the worst that had been seen for many years. Says the former[3]: "I believe that the present epidemic has been more general in this place and its vicinity than ever happened within the remembrance of any medical man at present living,

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[1] Samuel Fothergill, M.D., and others, in *Med. and Phys. Journ.* XVIII. (Dec. 1807), pp. 569, 572; XIX. 91, 185.

[2] "The Epidemic Measles of 1808." By Dr Ferguson. *Med. and Phys. Journ.* XXI. 359.

[3] John Roberton, *Med. and Phys. Journ.* XIX. 182, 272, 278, 471.

and I am sorry to say it has been very fatal." The Aberdeen chronicler says the mortality was "greater than we have witnessed for a long period," and that the epidemic was general throughout the whole of England and Scotland. But, besides this direct testimony, there is a not less indirectly significant fact of the epidemic. It affected many adults—"persons of all ages, who had never had them," says the Aberdeen writer: few persons escaped, says the Edinburgh observer, "who had been previously unaffected by this disease." The deaths from pulmonic complaints did not often happen among children, but among people somewhat advanced in life. Significant also was the outbreak in the Invernessshire Militia, which marched into Edinburgh in March while the epidemic was raging. Fifty men, all young recruits newly joined, were attacked in the course of a few days, the others escaping the disease though equally exposed to it; in some of those who died in the regiment there were found, on opening the thorax, fibrinous pleurisy and pericarditis, with effusion of fluid, as well as evidences of bronchial catarrh[1]. The Aberdeen writer says: "I always observed that in full-grown persons the eruptions were more numerous, quicker in appearing, and longer in going off than in young subjects.... Many full-grown persons were very ill, yet the measles were more fatal to the young." The implication of so many adults in the severe epidemic of 1808 would of itself show that measles had not been for some time before a steady and universal affection of infancy and childhood[2].

Measles in Glasgow in 1808 and 1811–12: Researches of Watt.

The measles epidemic of 1808, which appears to have been somewhat general in England and Scotland, made an extraordinary impression in Glasgow. That disease had never before been nearly so mortal there, nor had any infection since the time of the plague, not even smallpox itself, engrossed the burial registers so much as measles did in the months of May and

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[1] Roberton, *loc. cit.* XIX. 471.

[2] In the earlier period, according to Grainger, Lind and others, numerous cases of measles sometimes occurred on board ships of war.

June, 1808. Glasgow had been the worst city in the kingdom for smallpox; by a somewhat sudden transition the infancy of the city died for a few months in larger numbers by the new disease than by the old. The highest monthly mortalities from smallpox had been 114 in October and 113 in November, 1791, the population being 66,578; but in 1808, the population having increased to 100,749 by the census of 1811, measles carried off 259 children in May and 260 in June, and in the months before and after as follows:

Measles in Glasgow, 1808.

Month	Deaths	Month	Deaths	Month	Deaths
Jan.	2	May	259	Sept.	22
Feb.	2	June	260	Oct.	10
March	5	July	118	Nov.	4
April	71	Aug.	32	Dec.	2

The figures were not known at the time; but every doctor in Glasgow, as well as the whole populace, knew that measles was cutting off the infants, while smallpox had fallen to insignificance. So dramatic was this turn in the public health that the common people set it down to the new practice of inoculating children with cowpox: ready to believe anything of vaccination, they concluded that, if it kept off smallpox, it brought on measles. Dr Robert Watt took the trouble to refute this singular notion; he found in his own practice that three children in one family, and in another two, had died of measles who had neither been vaccinated nor had smallpox before. Another great epidemic of measles arose in Glasgow three years after, in the winter of 1811–12:

1811	Measles deaths	1812	Measles deaths
October	12	January	130
November	76	February	61
December	161	March	30
		April	19
		May	15
		June	18

Those two great epidemics of measles in Glasgow, in 1808 and 1811–12, were the occasion of one of the earliest and most memorable inquiries in vital statistics in this country, the research by Dr Robert Watt on "the Relative Mortality of the Principal Diseases of Children, and the numbers who have died

under ten years of age in Glasgow during the last thirty years[1]." Having begun with a search of the principal Glasgow burial-registers for deaths by whooping-cough, he extended it to sixteen folio volumes of the registers of all the burial-grounds, old and new, and included the mortalities from all causes with the ages at death, and from fevers and the principal diseases of infancy and childhood. The increase of population from 1783, when his figures begin, to 1812, the date of his writing, was known to him; but as the numbers living at the respective periods of life were not known, he was obliged to state the change in the mortalities at the various ages, and from the various diseases, in ratios of the annual deaths from all causes,—a perfectly scientific comparison so long as the nature of the ratios compared was clearly stated. It would have been more satisfactory, of course, if the comparison could have been made in terms of the annual death-rate, which was much lower (for reasons already explained), in the second half of his period than in the first; but, in the circumstances, that was impracticable, and Watt did the next best thing. The following is the principal part of his table of ratios in five successive periods of six years each:

Vital Statistics of Glasgow in sexennial periods, 1783–1812. (*Watt.*)

Period	Sum of all deaths	Per cent. under Two	Per cent. from Two to Five	Per cent. from Five to Ten	Per cent. of Smallpox	Per cent. of Measles	Per cent. of Whooping-cough	Per cent. of "Bowel-hive"
1783–88	9994	39·40	10·66	3·42	19·55	0·93	4·51	6·72
1789–94	11103	42·38	11·90	3·79	18·22	1·17	5·13	6·43
1795–1800	9991	38·82	12·21	3·45	18·70	2·10	5·36	6·47
1801–06	10304	33·50	13·43	5·10	8·90	3·92	6·12	7·27
1807–12	13354	35·89	14·22	5·58	3·90	10·76	5·57	9·26

The actual deaths from smallpox, measles and whooping-cough are shown in the next table, which includes for comparison the corresponding figures from the London bills of mortality:

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[1] Published as an Appendix to his *Treatise on the History, Nature and Treatment of Chincough*. Glasgow, 1813. Reprinted by John Thomson, Glasgow, 1888. Dr Watt is best known by his *Bibliotheca Britannica* (Edinburgh, 1819. 4 vols. 4to.), a wonderfully complete bibliography under the dual arrangement of subjects and authors, which is still indispensable for research in every branch of knowledge. Perhaps the many who use it are not all aware that it was the labour of a physician in Glasgow (originally a surgeon at Paisley), who died (in 1819) at the age of forty-five, having reached such professional distinction in his own city as to be elected President of the Faculty of Physicians and Surgeons.

Smallpox, Measl ,nd Whooping-cough in London and Glasgow,
1783-1812.

	London			Glasgow		
Year	Smallpox	Measles	Whooping-cough	Smallpox	Measles	Whooping-cough
1783	1550	185	268	155	66	153
1784	1759	29	457	425	1	41
1785	1999	20	194	218	0	34
1786	1210	793	200	348	2	173
1787	2418	84	228	410	23	57
1788	1101	55	298	399	1	17
1789	2077	534	374	366	23	45
1790	1617	119	391	336	33	177
1791	1747	156	279	607	4	117
1792	1568	450	311	202	58	68
1793	2382	248	352	389	5	112
1794	1913	172	469	235	7	51
1795	1040	328	311	402	46	180
1796	3548	307	536	177	92	60
1797	522	222	567	354	5	76
1798	2237	196	418	309	3	98
1799	1111	223	451	370	43	95
1800	2409	395	380	257	21	27
1801	1461	136	428	245	8	125
1802	1579	559	1004	156	168	90
1803	1202	438	586	194	45	60
1804	622	619	697	213	27	52
1805	1685	523	703	56	90	129
1806	1158	530	623	28	56	162
1807	1297	452	439	97	16	85
1808	1169	1386	326	51	787	92
1809	1163	106	591	159	44	259
1810	1198	1031	449	28	19	147
1811	751	235	486	109	267	62
1812	1287	427	508	78	304	103

The ratio of deaths under the age of two had decreased greatly in Glasgow, while the ratios from two to five and from five to ten had increased. At the same time smallpox had almost ceased (but only temporarily, as it appeared) to be the great infectious scourge of infancy, while measles had come in its place. "Now that the smallpox are in great measure expelled," (Watt believed that cowpox inoculation had done this), "the measles are gradually coming to occupy the same ground which they formerly occupied. I am sorry to make this statement, but the facts, at least with regard to Glasgow, are too strong to admit of doubt."

In order to explain the enormous increase of deaths by measles, he had recourse to the following argument. Formerly nearly all children, say nine-tenths, had both smallpox and measles, the attack of smallpox in most cases coming first. Children who had survived smallpox were fortified by

that ordeal, not merely as selected lives, but positively fortified, so that measles, when it assailed them in due time afterwards, was taken mildly or was "modified," not one in a hundred cases proving fatal. But now (1813), when so few children have been through the smallpox, measles has become ten times more fatal to them, although it could hardly be more common than it used to be. Having found it necessary to assume that children in former times took smallpox before they took measles, nine-tenths of them taking both, he qualifies this in another passage: "Still, however, as the measles came round now and then, as a very general epidemic, they must occasionally have had the precedence, and it was perhaps chiefly among such patients that the disease proved fatal."

The measles which came round now and then as a general epidemic was nearly the whole of it; even in London there were intervals of several years with only a few annual deaths, and in smaller towns or country districts the clear intervals were longer. The prevalence of measles on the great scale being more casual than that of smallpox, it is likely that most children had taken smallpox before they incurred measles. But it is clear from such instances as the London epidemic of 1674, and the epidemic in the Foundling Hospital in 1763, that measles might attack children just before smallpox, and by its weakening effects, increase the number of victims of the latter. As to the fatality of measles itself in the 17th and 18th centuries, the statement of Watt that it did not amount to one death in a hundred attacks, while it can neither be proved nor disproved by an array of figures, can be shown to be inconsistent with the language of annalists. The epidemics of measles varied in severity then as afterwards: that of 1670 in London was regular and mild, that of 1674 in the very same months of the year was anomalous and fatal; Huxham characterizes the measles at Plymouth in the winter of 1749–50 as "maximé epidemici, imo et saepe pestiferi"; at Kidderminster, in 1756, after fevers had been very fatal to adults, the measles went through the town so that an immense number of children "died tabid"; in the West of England about 1760 a disease called measles made "a melancholy carnage amongst children."

While Watt's theory of the working of this principle of substitution is open to criticism on some points of detail, the law itself, as enunciated by him, remains to the present time one of the soundest and most instructive generalities in epidemiology. He based it upon a laborious search of the burial registers, such as no one before him in this country had undertaken. Next he saw correctly that a great rise in the deaths of infants by such a disease as measles could only be accounted for by a great increase in the rate of fatality. Thirdly, he connected the loss from measles with the saving from smallpox. Adopting an old opinion, which may be discovered in Willis[1], he argued that smallpox, when taken first, served to fortify children so that they passed easily through the measles afterwards; but in the following passage he indicated a better reason why the absence of smallpox gave measles the chance of proving more fatal: "In this point of view we are not to consider the smallpox as so peculiarly

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[1] *De Febribus*, 1659. Cap. XV.

fatal in their nature. They perhaps prove so fatal merely by having the start of other diseases. The measles, the chincough, the croup, the scarlet fever, and perhaps many others, would have proved equally fatal had they occurred first." The principle is true to this extent, that a certain proportion of weakly infants, or children of poor stamina, will succumb to almost any disease —if not to smallpox, then to measles, and if not to measles directly, then to the sequelae of measles. This was perceived in the form of a necessary truth by Haygarth in 1793: "A considerable number of those who now die of the smallpox would die in childhood of other diseases if this distemper were exterminated[1]." It was commonly believed that smallpox had at length found its real artificial check, not in the inoculation of itself, but in the inoculation of cowpox. At all events it had declined greatly in Glasgow. During the three years before the measles epidemic of 1808, there could hardly have been more than a thousand children attacked by smallpox, or not one in ten of all the children born. During several years the infancy of the city had been spared any great ordeal of infectious disease; the first epidemic that came along happened to be measles, so that it fell to that infection to take off the weaklings. In the economy of nature it is impossible to rear all the young of a species, nor would it be good for the species if it were possible. It is among the birds that the principle of population, or of the survival of the fittest, is seen working in the most admirable way: the annual migration of many species to breed in a remote country brings with it an ordeal for the birds of the year in finding their way to the winter feeding-grounds—an ordeal which only the strongest come through. For some unexplained reason, the young of the human species are peculiarly tried by infectious diseases, which multitudes pass through safely, while many of poor stamina or of ill tending are cut off.

Dr Watt's teaching as to the displacement of one infectious cause of death by another was resisted at the time as being of "evil tendency" for the pretensions of vaccination, although Watt believed as firmly in the virtues of cowpox as Jenner himself did. Writing to James Moore on 6 Dec. 1813, Jenner says of Watt's essay (Baron, II. 392): "There is nothing in its title that developes its purport or *evil tendency*.... Is not this very shocking? Here is a new and unexpected twig shot forth for the sinking anti-vaccinist to cling to." Sir Gilbert Blane, who was then president of the Medical and Chirurgical Society, having a natural fondness for ideas of all kinds expressed in a paper to that society rather more approval of Watt's

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[1] *Sketch of a Plan to exterminate the Casual Smallpox, &c.* London, 1793, p. 152.

view than was thought prudent: "An ingenious friend of mine has remarked to me in conversation that some light is thrown on this subject by considering that whichever of the epidemic maladies attack children first, it will be the most fatal, inasmuch as all feeble constitutions will fall in its way while the stronger will be left to encounter the attacks of the others; and that the smallpox, owing probably to the greater abundance and rankness of their effluvia, are generally caught in a casual way before measles, hooping cough and scarlet fever, and are therefore reckoned more fatal than any of these. But, a new field of research being opened," etc. Efforts were made to correct the effect of this, by showing that measles in some parts of the country had not been more fatal than usual. Holland, of Knutsford, attributed the fatality of the epidemic in 1808 to a change of the wind to the east. Writers in the *Edinburgh Med. and Surg. Journal* pointed out that Watt had compared the absolute deaths by smallpox at one time and by measles at another without taking account of the increase of population, and the rates of mortality from each disease. The best criticism of Watt was by Roberton in his *Mortality of Children*, 1827, p. 49. He offers the following considerations, without seeming to know that they were really to be found in Watt's own essay: Smallpox used to be caught first; it swept off the feeble and sickly, leaving the strong and vigorous *only* to encounter the attacks of other diseases. "That infectious febrile disease to which in early infancy there is the strongest predisposition will of course in general make the first attack and prove the most fatal of any." There were reasons why measles used to have comparatively few victims, "and why, when they now prevail epidemically, they, as was the case with smallpox, are caught at an earlier age than other diseases in general and prove so very fatal: which happens not more from their priority in attack than from being in their nature what they were ever considered—a severe and dangerous disease. We are to recollect, however, that measles do not in general attack at so early an age as smallpox; nor ever, like the latter, destroy eight or nine-tenths of all the children that die in the place where they happen to prevail, as was the case in the variolous epidemics of Chester and Warrington [this is an error, *vide supra*, p. 554]; consequently we have reason to hope that neither measles nor any other infantile disease will, as Dr Watt imagined, 'come to occupy the place which smallpox once occupied,'" (p. 58). A feeble echo of Roberton's criticism, with all its scientific candour left out and its points against Watt emphasized in a spirit of paltry cavilling, was heard next year in the Goulstonian Lectures of Bisset Hawkins on *Elements of Medical Statistics*, 1829.

Many years after, when the enormous increase of deaths by scarlatina was illustrating the doctrine of displacement in a new way, Dr Farr gave a full analysis of Watt's essay in his annual Letter to the Registrar-General for the year 1867, and endorsed the Glasgow teaching of 1813 with more heartiness than it had hitherto received. Although Farr did not take the Malthusian view that the loss of weakly children by one means or another was inevitable, yet he could not help seeing, in his work upon the registration returns from 1837 onwards, that one infection had been taking what another spared. He recurred to Watt's doctrine time after time in his annual reports, and in that of 1872 (p. 224), expressed his belief thus plainly: "The zymotic diseases replace each other; and when one is rooted out, it is apt to be replaced by others which ravage the human race indifferently whenever the conditions of healthy life are wanting. They have this property in common with weeds and other forms of life: as one species recedes, another advances."

Two remarks remain to be made under the doctrine of displacement. The first is that the substitution of measles for

smallpox was one of a series of such changes in the public health of Britain. The great infective scourge of medieval and early modern periods had been plague, which destroyed at times immense numbers of the valuable or mature lives. Its successor was typhus fever, which also cut off the parents more than the children, but did not retard population as the plague had done. The saving of life by the extinction of plague was in great part balanced by the loss from smallpox, which fell, however, more and more upon the earliest years of life until at length it was almost confined to them. The first great decline of smallpox itself corresponded to a great decline of typhus fever during the second half of the French war; but while there was no great infectious disease in those years to thin the ranks of the adults, measles took the place of the more loathsome smallpox in cutting off a certain number of young lives. While the older types of infection have disappeared the incidence has shifted from mature lives to children, so much so that at the present time enteric fever, and occasional choleras and influenzas, are almost the only infections that correspond to the old plague and to typhus fever in their age-incidence.

The other remark is that the greater prevalence or fatality of measles, as if in lieu of smallpox, meant a good deal more for the bills of mortality than actually appeared under the name of measles. Smallpox was not an infection that did much constitutional damage to those that came through it, although it sometimes destroyed the vision and spoiled the beauty of the face. On the contrary, it was held by many that the general health was better after an attack of smallpox than before; and, if personal experience can justify an opinion, that ought to be my own view of the matter[1]. But measles is an infection peculiarly apt to leave mischief behind. The bronchial catarrh, which is an integral part of the malady, and is often the cause of death in the second stage of the attack, may so affect weakly children that the respiratory organs are permanently damaged. Tuberculosis of the lungs is apt to follow measles. Some children, again, fall into mesenteric disease after measles, and die

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[1] It was believed that smallpox left ill effects in some constitutions. William III. is said to have had the dregs of smallpox in his lungs. Roberton (u. s.) cites Saunders as teaching that smallpox caused scrofula, and he is himself doubtful whether an attack of it ever improved the constitution. Dr Moses Younghusband, of New Lebanon Springs, *Med. Phys. Journ.* XI. (1804), 317, wrote: "I see no more of the glandular suppurations formerly so frequent and unavoidable" after smallpox.

tabid, the intestinal catarrh being as dangerous in one way as the bronchial is in another. Another large proportion of the subjects of measles take whooping-cough[1]. While smallpox did its work summarily, the full effects of measles were longer in being realized. This may in part explain the fact brought out by Watt, that while fewer children died under two years of age, measles being the dominant epidemic disease, there was an increase in the ratio of deaths from all causes between the years of two and five and from five to ten.

Measles in the Period of Statistics.

The history of measles for nearly a generation after the great epidemics of 1808 and 1811–12 is little known. No one in Glasgow continued Watt's laborious tabulation of the causes of deaths in the numerous burial registers[2]; nor was any regular account kept elsewhere except by the Parish Clerks of London. The following deaths by measles in their bills from 1813 to 1837, when the modern registration began, were probably no more than from a third to a half of the deaths in all London:

Year	Measles deaths	Year	Measles deaths	Year	Measles deaths
1813	550	1822	712	1830	479
1814	817	1823	573	1831	750
1815	711	1824	966	1832	675
1816	1106	1825	743	1833	524
1817	725	1826	774	1834	528
1818	728	1827	525	1835	734
1819	695	1828	736	1836	404
1820	720	1829	578	1837	577
1821	547				

The inadequacy of these figures to the whole of London will appear from the fact that the registration returns under the new Act gave for the last six months of 1837 the measles deaths at 1354, while the bills of the Parish Clerks gave them at 577 for the whole year. But the old bills enable us to compare the deaths from different diseases within the same area and under

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[1] Johnstone, *Malignant Epidemic Fever of* 1756, London, 1757, says of Kidderminster during a season of high mortality from fever and other diseases: "The measles at this time went through our town and neighbourhood. The children commonly got over the usual course of this distemper; but vast numbers died tabid of its consequences. The chincough succeeded the measles."

[2] The *Edin. Med. and Surg. Journ.* XXVI. 177, cites from Cleland, with a reference which I have not succeeded in verifying, the following Glasgow figures for the period 1813–19: all deaths 22,060, smallpox 236 (1·07 per cent.), measles 614 (3·69 per cent.). But see Cowan, *Glas. Med. Journ.* V. 358, *supra*, p. 597.

the same system of collection, and to compare the deaths "within the bills" in a series of years since the last of the new parishes were taken in about the middle of the 18th century. Using the bills so far legitimately, we find that measles at length came to be of equal importance with smallpox itself as a cause of death in childhood, and that it had become a larger and steadier total from year to year.

So far as concerns Glasgow, the high mortality from 1807 to 1812, making 10·76 on an annual average of the deaths from all causes, was not maintained. When the tabulation of the causes of death was resumed from 1835, the annual average of measles for the five years ending 1839 was found to be only 6 per cent. of the deaths from all causes, the average of smallpox having come back to 5·3 per cent. During that unwholesome period, in which there was much distress among the working class and a great epidemic of typhus, measles and smallpox were dividing the infectious mortality of childhood somewhat equally, the age-incidence of measles being only a little lower than that of smallpox:

Ages of the Fatal Cases of Measles in Glasgow, 1835–39[1].

	Under one	1–2	2–5	5–10	10–20	20–30	30–40	40–50	Total
1835	116	141	121	34	10	4	–	–	426
1836	86	209	183	38	1	1	–	–	518
1837	77	133	122	16	2	1			350
1838	76	124	161	39	3	1	1		405
1839	165	259	275	73	7	2		1	783
	520	866	863	200	23	9	1	1	2482

In Limerick, which may stand for a typically unhealthy Irish city in the worst period of over-population, there were many more deaths from smallpox among children than from measles, the age-incidence being nearly the same, according to the following dispensary statistics for a number of years before 1840[2]:

Limerick Dispensary Deaths.

	Age 0–5	5–10	10–15	15–20	Total
Smallpox	333	55	5	0	393
Measles	187	32	6	1	226
Scarlatina	8	2			10

Although it is impossible to prove it, yet the indications all point to measles having kept for a whole generation after 1808 the leading place among infantile causes of death which it then

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[1] Cowan, *Journ. Statist. Soc.* III.

[2] Griffin, *ibid.* III.

for the first time definitely took[1]. Almost the only direct references to the subject were made by way of controverting the doctrine of Watt; but these are too meagre, or too general in their terms, to be of any use[2]. The epidemics of measles seem to have travelled then, as they do now, from county to county in successive years. Thus in 1818, while most parts of England were or had recently been suffering from smallpox, the Eastern counties were suffering from measles "very frequent and fatal." Smallpox at length reached Norwich in 1819, and became the reigning epidemic in the place of measles, which was "hardly met with" so long as the enormous mortality of the other disease proceeded[3]. At Exeter in the spring of 1824 measles became epidemic after a long interval; many susceptible children had accumulated, and of these few escaped. The mortality was very great, and was caused by severe pulmonary inflammation, the catarrhal symptoms being mild. In one day seventeen children were buried in one of the five parish churchyards of the city; but that high mortality, according to the parochial surgeon, did not on an average stand for more than four deaths in one hundred cases[4].

When the curtain rises, in the summer of 1837, upon the prevalence and distribution of diseases in England, as ascertained by the new system of registration of the causes of death, measles is found in the first place among the infectious maladies of childhood, thereafter yielding its place to smallpox for a year or more, and taking the lead again until it was passed by scarlatina.

Deaths by Measles and Smallpox in London, 1837–39.

	1837		1838				1839
	3rd Qr.	4th Qr.	1st Qr.	2nd Qr.	3rd Qr.	4th Qr.	(four quarters)
Measles	822	532	173	96	94	225	2036
Smallpox	257	506	753	1145	1061	858	634

The epidemic of smallpox hardly touched the Eastern counties until 1839; so that while the home counties in that year had

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[1] Macmichael, in an essay on scarlatina and other contagions, 1822, says: "Parents considering the measles as a disease almost inevitable have wisely chosen to expose their children to the contagion at such auspicious times [summer season]; so that the disorder may be once well over, and all further anxiety at an end." p. 30.

[2] P. Macgregor, *Med. Chir. Trans.* V. 436, obtained from Henry, of Manchester, the burials from measles at the Collegiate Church and St John's Church for two years, 1812–13, which when compared with those abstracted by Percival from the former register for twenty years, 1754–74, showed a higher ratio of measles to the burials from all causes.

[3] Cross, u. s.

[4] Delagarde, *Med. Chir. Trans.* XIII. 163.

far more deaths by measles than by smallpox, Norfolk had only 72 deaths by the former against 820 deaths by the latter. In the same year measles took the lead in four out of six great English towns, scarlatina being the dominant infection in one (Sheffield), and smallpox in one (Bradford):

Deaths in 1839 *by the three chief infections of Childhood.*

	Liverpool	Manchester	Leeds	Birmingham	Sheffield	Bradford
Measles	401	773	383	170	33	70
Scarlatina	374	264	35	133	419	7
Smallpox	259	237	171	56	16	208

In all England and Wales during fully half-a-century of registration, measles has fluctuated somewhat from year to year but has not experienced a notable decline among the causes of infantile mortality (see the table at p. 614). In the decennial period 1871–80, its annual average death-rate was 377 per million living; in the next decennium it rose to 441, the previously high rates of scarlatina having fallen greatly. Among the highest rates for the ten years 1871–80, were those of Plymouth, 1·13 per 1000, East Stonehouse 1·79, and Devonport 1·19 (owing to a great epidemic in 1879–80), Exeter, 0·82, Liverpool ·91, Bedwelty (Tredegar and Aberystruth collieries) 0·88, Wigan 0·74, Whitehaven 0·71, Alverstoke 0·81. In the most recent period there have been some very high death-rates; thus at Jarrow the annual rate, which was only ·27 per 1000 from 1871 to 1880, rose in the nine years 1881 to 1889 to an annual average of ·94, having been made up almost wholly by great epidemics every other year—in 1883 (2·9), 1885 (2·4), 1887 (1·4), and 1889 (·9)[1]. In the year 1888, an epidemic at Stoke-on-Trent, Hanley, &c. with 342 deaths, made a rate of 2·8 for the year; in Wolstanton, Burslem, &c., 221 deaths were equivalent to a rate of 2·6.

The latest reports of the Registrar-General have traced a progression of the epidemic of measles from county to county or from district to district in successive years, such as was remarked, both for smallpox and measles, by some of the 18th century epidemiologists in England, Scotland and Ireland.

Thus in 1890, measles was epidemic in Cheshire, South Lancashire and North Staffordshire; in 1891 it ceased in these, but became epidemic in North Lancashire, South Staffordshire and the West Riding; in 1892 it

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[1] A. Campbell Monro, M.D., "Measles: an Epidemiological Study." Chiefly from the Jarrow statistics. *Trans. Epid. Soc.* N. S. X. (1890–91), p. 94. The author connects the recent increase with the greater concourse of children to infant and elementary schools under the Education Act.

ceased in its last-mentioned area, and became epidemic in Warwickshire, Leicestershire, Derbyshire, the East and North Ridings, Westmoreland and Durham. During the same three years a similar progression or cycle was observable (on looking over the tables) in the South-west of England. The epidemic year of measles in Devonshire was 1889. It ceased there, and became epidemic in 1890 in Cornwall on the one side and in Somerset on the other, sparing Dorset. In 1891 it ceased to be epidemic in those parts of Cornwall and Somerset which it occupied in 1890, and became prevalent in the extreme west of Cornwall, in parts of Somerset, in Wiltshire and in Gloucestershire. In 1892 it ceased in all the last-mentioned excepting Gloucestershire, and became epidemic in Dorset, where there had been no severe prevalence of measles since 1888[1].

Measles has no such decided preference for a season of the year as scarlatina and enteric fever have for autumn or infantile diarrhoea has for summer. But it often happens that most deaths are recorded from May to July, owing, doubtless, to the greater number of attacks in summer and not to any excessive fatality of that season. In London and the great industrial towns the deaths are spread somewhat uniformly over the year; or, in the language of statisticians, the maxima do not rise far above the mean of the year. In a tabulation of the weekly deaths in London from 1845 to 1874[2], it appears that they touch a higher point in mid-winter (Nov.–Jan.) than in summer, a fact which may be readily accounted for by the injurious effects of the London air in winter upon a disease which is largely a trouble of the respiratory organs. In the great industrial populations of Lancashire, which resemble London in their high death-rate from measles, the rise of the deaths in mid-winter is almost the same as the summer increase[3].

Most of the deaths from measles fall at present upon the ages from six months to three years, just as they did when the deaths were comparatively few, as at Manchester from 1768 to 1774. Deaths of adults, which were not altogether rare in the first great epidemic of modern times in 1808, are seldom heard of at present, for the same reason that adult deaths used to be uncommon in smallpox, namely, that the disease is passed by almost everyone in infancy or childhood. Although the deaths from measles sometimes reach large totals—in London during

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[1] *Rep. Reg.-Genl.* LIV. p. xviii, and LV. p. xi. The explanation given is as follows: "When a county or other area has been visited by a severe epidemic [of measles] there is for several succeeding years scarcely sufficient material, in the shape of unprotected children, for another considerable outbreak, unless it be in very populous areas such as London or Liverpool; and in such places the disease is endemic."

[2] Buchan and Mitchell, *Journ. Scot. Meteor. Soc.* July, 1874, p. 194.

[3] Ogle, in the 47th Report of the Registrar-General (for 1884), p. xv.

the spring of 1894 they were in some weeks as high as one hundred and fifty—yet it is the common experience of practitioners that a strong or healthy child rarely dies of measles, that the fatalities occur among the infants of weakly constitution, and especially in the numerous families of the working class in the most populous centres of mining, manufactures and shipping.

To bring these various characteristics of measles together in a concrete instance, I shall give briefly the facts of a recent epidemic in a town in Scotland of some twelve thousand inhabitants. There had been only five deaths from measles for two years. There had not been a case of smallpox for at least ten years. The measles epidemic, when its triennial opportunity came, reached a height in July, on a certain day of which month there were seven or eight burials from measles or its direct sequelae. Nearly all the children in the place who had not been through the measles in the corresponding epidemics of 1889 or 1887 suffered from it on this occasion, excepting the class of very young infants. The deaths in the whole epidemic numbered about fifty, which would not all be registered, however, as from measles. Yet this high mortality was not due to any unusual malignancy of the disease, but to the feeble stamina of a certain number of infants, or to the indifferent housing and tending of the poorer class. One did not hear of a death in the well-to-do families (probably there was none), although they had their full share of attacks. The frequency of the burials for a short time, and the effects of the epidemic on the mortality from first to last, must have been very nearly the same as in an epidemic of smallpox a century before, when the population was only a third or fourth part as large. But in the period when smallpox was in the ascendant, having few rivals among the infective causes of death in childhood, the general conditions of health in this town were altogether different. One or two specimens of the thatched huts of the poorer class had been left standing into the era of photography, so that we could compare past with present, in externals at least; also, of the houses of the richer class some still remained, perhaps turned into tenement-houses, with small windows, low doorways, and crow steps on their gables; and it was on record by the parish minister at the end of the 18th century, that within the memory of that generation there had been peat stacks and dunghills before the doors on the High Street of the burgh.

CHAPTER VI.

WHOOPING-COUGH.

It is singular that a malady so distinctively marked as whooping-cough is should figure so little in the records of disease from former times. Astruc could find no traces of it in the medical writings of antiquity or of the Arabian period. In modern times the first known account of an epidemic of it is under the year 1578, when Baillou of Paris included a prevalent convulsive cough as part of the epidemic constitution of that year, remarking in the same context that he knew of no author who had hitherto written of the malady[1]. Yet, if whooping-cough had been as common in former times as it has been in quite recent times, it deserved a high place among the causes of infantile mortality. Doubtless it occurred in former times in the same circumstances in which it occurs now. Baillou in 1578 speaks of it as a familiar thing; and it can be shown from an English prescription-book of the medieval period that remedies were in request for a malady called "the kink," a name which survives in Scotland (like other obsolete English words of the 15th century) in the form of "kink host[2]."

In Phaer's *Booke of Children* (1553) chincough is not named. It is perhaps more singular that the disease should be omitted from the list in Sir Thomas Elyot's *Castel of Health* (1541), of maladies proper to three periods of childhood; for that list has every appearance of being an exhaustive enumeration[3]. Still, it would be erroneous to suppose that the convulsive cough of

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[1] Cited by Hirsch, *Geogr. and Histor. Pathology.* Eng. transl. III. 28.

[2] *Harl. MSS.* No. 2378. Moulton's *This is the Myrour or Glasse of Health*, circa 1540, is in the main a printed reproduction of this manuscript prescription-book. The same receipt which is "for ye kink" in the one, is "for the chyncough" in the other (formula LXXIX.).

[3] "Sycknesses happenynge to children:—When they be new borne, there do happen to them sores of the mouth called aphte, vometyng, coughes, watchinge, fearefulness, inflamations of the nauelle, moysture of the eares. When they brede

children which is so common an epidemic incident in our time, and in some impressionable subjects is the almost necessary sequel of a coryza or catarrh, did not then occur in the same circumstances as now. When Willis, in his *Pharmaceutice Rationalis* of 1674, remarks that pertussis was left to the management of old women and empirics, he suggests the real reason why so little is said of it in the medical compends. Sydenham mentions it twice, and on both occasions in a significant context. Under the name of pertussis, "quem nostrates vocant *Hooping Cough*," he brings it in at the end of his account of the measles epidemic of 1670, without actually saying that it was a sequel of the measles. His other reference to it, under the name of the convulsive cough of children, comes in his account of the influenza of 1679. In both contexts it is adduced as an instance of a malady much more amenable to bloodletting than to pectoral remedies, the depletion being a sure means of cutting short an attack that was else very apt to be protracted, if not altogether uncontrollable[1]. One glimpse of it we get among the children of a squire's family in Rutlandshire in the summer of 1661. On the 26th of May the mother of the children writes to her husband then on a visit to London[2]:

> "I am in a sad condition for my pore children, who are all so trobled with the chincofe that I am afraid it will kill them. There is many dy out in this town, and many abroad that we heare of. I am fane to have a candell stand by me to goo in too them when the fitt comes." On 2 June, the children are still "all sadly trobeled with the chincofe. Moll is much the worst. They have such fits that it stopes theare wind, and puts me to such frits and feares that I am not myselfe." In a third letter, the children "are getting over the chincofe. I desire a paper of lozenges for them"; and on 30 June, the children are better, but the smallpox is still in the village. It was probably from the latter disease that many were dying.

In Dr Walter Harris's *Acute Diseases of Infants*[3], the convulsive or suffocative coughs are mentioned in one place without being identified as chincough, while in two or three other places the malady is briefly referred to under its name. Thus, "corpulent and fat infants troubled with defluxions, and having an

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tethe, ytchinge of the gummes, fevers, crampes and laskes. When they waxe elder, than be they greved with kernelles, opennesse of the mould of the head, shortnesse of wynde, the stone of the bladder, wormes of the bealy, waters, swellynges under the chynne, and in Englande commonly purpyles, measels and small pockes."

[1] *Obs. Med.* 3rd ed. Bk. IV. chap. v. § 8; *Epist. Respons.* I. § 42.

[2] Mary Barker at Hambleton, to Abel Barker at the Dog and Ball in Fleet Street. *Hist. MSS. Commis.* v. 398.

[3] *Tractatus de morbis acutis infantum.* Lond. 1689. Englished by W. Cockburn, M.D. London, 1693, pp. 38, 78, 87.

open mould, are most subject to the rickets, chincough, king's evil, and almost incurable thrushes." Again, chincough of infants is one of the inflammatory diseases that are "not altogether free from contagion"; and again: "Albeit that any notable translation of the subject matter of the fever into the lungs, and chincoughs, do advise bloodletting for the youngest infants, yet it is most evident that it is not a remedy naturally convenient for them....And therefore its help is not to be invoked for all the diseases of infants except in the chincough or any other coughs that do attend and are concomitants of fevers that do suddenly begin"—showing his deference to Sydenham, his master.

Probably the "any other coughs" are those that he thus describes in another place (p. 26):

> "Moreover he is often troubled with a slight, dry cough, though sometimes it is strangling and suffocative: with a dry cough because of the sharpness and acrimony of the humours that continually prickle the most sensible branches of the windpipe; but the choaking doth proceed from the abundance of serous and watry humours that so fill up and burden the small vesicles of the lungs that it cannot be cast off and discharged. But also they being endued with a great debility and weakness of nerves, and a superlative softness and delicacy of constitution, they are not able to subsist with that violent trouble of coughing, but do succumb under that unnatural and excessive motion of their breast, and their face is blackish as that of strangled people."

These were cases of whooping-cough, although they are not so called. Among his eleven cases, Harris gives two in infants of the Marquis of Worcester; one had been "very often troubled with an acute fever," and was found to be much weakened by a chincough when the physician was called to him; the other, an infant of eleven months, had at the same time an acute fever "and a cough almost convulsive."

This inclusion, under the generic name of cough, of cases that had all the signs of whooping-cough, namely, the paroxysmal seizures, choking fits, and blackness of the face, is found also in the London bills of mortality. Although "coughs" are entered as the cause of a not very large number of deaths in the earlier annual bills, with an occasional special mention of whooping-cough among them, it is not until 1701 that "hooping cough and chincough" becomes a separate item, with six deaths in the year; next year the entry is "hooping cough" alone, with a single death, and so on for a number of years in which the deaths are counted by units; in 1716 they rise to eleven, and

continue to be counted by tens until 1730, when 152 deaths are set down to "cough, chincough, and whooping-cough." It would be a mistake to suppose that these figures during the first thirty years of the 18th century are anything like a correct measure of the number of infants in London who suffered from whooping-cough, or are at all near the number who might have reasonably been returned as dying from it. It was in that generation that the entries of the Parish Clerks became most indefinite as to the causes of death in infants, five-sixths of the enormous total of deaths under two years being entered under the generic head of "convulsions" and "teeth," while the item "chrysoms" received the deaths under one month old.

The increase of whooping-cough in the following table, from units to tens, from tens to hundreds, and thereafter to a somewhat steady total of hundreds year after year, can hardly be explained except on the hypothesis of more exact classification of infantile deaths, corresponding to the actual decline of the article "convulsions" in the second half of the century.

Years	Whooping-cough	Years	Whooping-cough	Years	Whooping-cough
1701	6	1731	33	1761	197
1702	1	1732	65	1762	300
1703	5	1733	97	1763	291
1704	0	1734	139	1764	251
1705	0	1735	81	1765	225
1706	2	1736	130	1766	213
1707	3	1737	160	1767	364
1708	3	1738	69	1768	262
1709	1	1739	72	1769	318
1710	5	1740	280	1770	218
1711	7	1741	109	1771	249
1712	3	1742	122	1772	385
1713	6	1743	92	1773	235
1714	6	1744	46	1774	554
1715	7	1745	135	1775	206
1716	11	1746	95	1776	181
1717	15	1747	151	1777	529
1718	24	1748	150	1778	379
1719	17	1749	82	1779	268
1720	33	1750	55	1780	573
1721	20	1751	275	1781	165
1722	21	1752	188	1782	78
1723	38	1753	65		
1724	25	1754	336		
1725	53	1755	93		
1726	37	1756	199		
1727	67	1757	239		
1728	21	1758	84		
1729	35	1759	227		
1730	152	1760	414		

(Continued in the table of measles deaths, p. 655)

It is not without significance that the vital statistics of Sweden were the first to give whooping-cough something like its rightful place among infantile causes of death: from 1749 to 1764 the deaths set down to that cause were 42,393, or an annual average of 2600, the epidemic year 1755 having 5832. In this we should find merely the influence of systematic nomenclature. Nosology, or the scientific classification of diseases, may be said to have begun under Linnaeus, who was for many years professor of medicine at Upsala before he became professor of botany, and was teaching a somewhat rudimentary nosology to the Swedish students of medicine before the great work of his friend and correspondent Sauvages made classifications general.

Concerning the year 1751, which has 275 deaths from whooping-cough in the London bills, Fothergill writes in May: "Great numbers of children had the hooping cough, both in London and several adjacent villages, in a violent degree. Strong, sanguine, healthy children seemed to suffer most by it; and to some of them it proved fatal where it was neglected or improperly managed"—the deaths having become more numerous towards the end of the year[1]. At Edinburgh, during the second year of high mortalities in the famine-period 1740–41, whooping-cough has 101 deaths to 112 from measles, having had only a fourth part as many the year before (see p. 523). In the Kilmarnock register from 1728 to 1763, "kinkhost" is credited with a total of 116 deaths, about 3 on an annual average, measles having a total of 93 during the same thirty-six years. In Holy Cross parish, a suburb of Shrewsbury, chincough has 9 deaths in the ten years 1750–60, and 6 in the next ten years, measles having 4 and 15 in the respective periods, and convulsions 9 and 31. In Ackworth parish, chincough has no deaths in the ten years 1747–57, and 2 in the next ten years, "infancy" having 13 in each decade, "convulsions" and measles none in the first, 6 and 2 respectively in the second. Warrington, in the disastrous smallpox year, 1773, had 16 deaths from chincough and 34 from convulsions. In the two years 1772 and 1773, Chester had 33 and 10 deaths from chincough, 70 and 69 from convulsions, 17 and 13 from "weakness of infancy."

Watt's researches in the registers of all the Glasgow burial-grounds brought out the fact that whooping-cough during a

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[1] *Gent. Magaz.* 1751, pp. 195, 578.

period of thirty years, 1783 to 1812, had been a common and somewhat steady cause of death among infants, having made 4·51 per cent. of the annual total of deaths at all ages in the first six years of the period, and 5·57 per cent. in the last six years[1]. This was a higher annual average ratio than in the London bills for the same period (see the tables at p. 647 and p. 655), and was probably the maximum in Britain, inasmuch as the Glasgow death-rate of infants was the worst from all causes.

Whooping-Cough in Modern Times.

When the causes of death began to be registered, in July, 1837, whooping-cough was found to have the following relative place among the principal maladies of children during the latter six months of the year in London and in all England and Wales.

Mortality by diseases of Children, last six months of 1837.

	London	England and Wales
Convulsions	1717	10729
Measles	1354	4732
Whooping-Cough	1066	3044
Smallpox	763	5811
Scarlatina	418	2550

Throughout the whole registration period, whooping-cough has kept its place steadily among the chief causes of infant mortality, neither decreasing nor increasing notably in the successive periods from 1837 to the present time. Its mortality has varied a good deal from year to year, owing to occasional great epidemic years such as 1866 and 1878; but on the mean annual average of decennial periods, it has varied little:

Annual Deaths by Whooping-cough per million living at all ages.

	Males	Females	Both sexes
1851–60	460	545	503
1861–70	487	566	527
1871–80	474	547	512
1881–90	—	—	451

No other epidemic malady has shown the same excess of female deaths in proportion to the numbers of the sex living, diphtheria being the only other that shows an excess at all

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[1] *Treatise on Chincough.* Glasgow, 1813.

The excess of deaths by whooping-cough among female infants was roughly shown by Watt in 1813, viz. 975 females to 842 males in the registers of the Glasgow High Church, College Church and the North-Western Cemetery, the relative numbers of the sexes living at the respective ages being then unknown. In all Scotland in 1889 the ratio was 1043 male deaths to 1225 female. The singular difference between the sexes in this respect is almost certainly related to the corresponding differences in the formation and development of the larynx, the organ which gives character, at least, to the convulsive cough of children. The expansion of the larynx in boys, which becomes so obvious at puberty and remains so distinctive of the male sex, is one of those secondary sexual characters which begin to differentiate quite early in life, and are probably congenital to some extent. It is not known whether female children are more often attacked than males; but it is probable that they are predisposed both to acquire coughs of the convulsive suffocative kind and to have their lives shattered by the attack—for the same anatomical and physiological reasons, namely, the imperfect development of the posterior space of the glottis with the spasmodic closure by reflex action[1]. The deaths have been nearly all under the age of five.

Deaths by Whooping-cough per million living at the respective age-periods.

	0—5	5—10
1851–60	3624	174
1861–70	3766	152
1871–80	3652	135

These proportions are almost the same as those given by Watt in 1813 from three of the Glasgow registers.

Period	Deaths by whooping-cough	Under five	Five to ten	Above ten
1783–1812	1817	1713	98	3

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[1] Vierordt, *Physiologie des Kindesalters*, Tübingen, 1877, p. 82, without adducing evidence that the larynx is congenitally different in the two sexes (a matter of very nice measurements which even Beneke does not appear to have attempted), says that the development of the posterior glottidean space has advanced before puberty much more in boys than in girls. Stark, a former Superintendent of Statistics for Scotland (*Rep. Reg. Gen. Scot. for* 1856, p. xxxviii), has raised the question thus: "The causes of this greater liability of the female sex to death while suffering from whooping-cough are worthy of being investigated. So far as one's own limited experience goes, it would appear to be produced by the greater tendency which the female sex exhibits to have fits or convulsions when attacked by a paroxysm or fit of coughing in that disease."

Most of the deaths are in the first year, and in a rapidly declining ratio until the fifth, according to the following rates per million of male children living at each age-period (these figures are for a single year, 1882):

Under one	One to two	Two to three	Three to four	Four to five
3039	2115	826	433	248

The mortality from whooping-cough falls very unequally on town and country. Thus, in Scotland in 1889, it caused 2268 deaths, being 3·13 per cent. of the deaths from all causes, and equivalent to a rate of ·58 per 1000 living. The death-rate varied as follows: ·91 in the eight principal towns, ·46 in the group of large towns, ·45 in the group of small towns, ·25 in the mainland rural districts, and ·08 in the insular rural districts. In England, the capital has more than its share of deaths from whooping-cough, Lancashire coming next, while the death-rates of Monmouthshire, Cornwall and Warwickshire are also a good deal above the mean of the whole country. The lowest death-rates are found in the purely agricultural counties.

During the last half-century there has been a decline in the death-rate from all causes, including the infectious diseases as a group; but it can hardly be said that whooping cough has had a due share in this decline. Notably in Ireland, where the decline of infectious disease has been most marked, it has been, as it were, pushed to the front of its class by the shrinkage of the other items. In Scotland it is now decidedly at the head of the list, and in England it has shared the first place with measles since the great diminution of scarlatina deaths.

Annual average Death-rates per 100,000 *living.*

		Whooping-cough	Measles	Scarlatina
England	1871–80	51·2	37·7	71·6
	1881–90	45·1	44·1	33·8
Scotland	1871–80	63·1	37·0	79·5
	1881–90	60·7	38·3	28·8
Ireland	1871–80	34·8	21·0	43·5
	1881–90	28·5	19·2	20·8

There is a small decrease in the death-rate of whooping-cough within the last decennial period, whereas in that of measles there is a slight increase (except in Ireland). The comparative steadiness of whooping-cough among the causes of death is doubtless owing to the fact that the bulk of its fatalities

are among infants, and that there appears to be an irreducible minimum of the deaths from all causes at that age-period.

Whooping-Cough as a Sequel of other Maladies.

Although it is convenient to group whooping-cough among the infectious diseases, and although it is a clear case of a malady that comes in epidemics, yet its pathology is peculiar. It seems to be more a sequel of other diseases than an independent or primary affection. The whoop of the breath, from which it is named, is really proper to any convulsive cough of some infants or children. Adults, having undergone the change in the form and relative size of the larynx at puberty, have the convulsive cough usually without the whoop if they have it at all. After the successive influenzas of recent years (1889–92), many adults suffered from convulsive paroxysmal cough which was whooping-cough in all respects but the whoop, the choking fits, the blackness of the face, and the vomiting being, of course, all kept in subjection by the greater control of adults over their reflex actions.

It has been often remarked that the ordinary whooping-cough of children has followed epidemics of influenza, or widely prevalent catarrhs. Thus, Hillary records in July, 1753, an epidemic of whooping-cough, or "the fertussis," all over the island of Barbados following the epidemic catarrh which was at a height in January of the same year. Whooping-cough had not been known in the island for many years past, "neither could I find by the strictest inquiry that I could make that any child or elder person did bring it hither[1]." Willan, in his corresponding records of the succession of diseases at the Carey Street Dispensary, London, from 1796 to 1800, has the following:

> "There was also among infants and children during the month of January [1796], an epidemic catarrh attended with a watery discharge from the eyes and nostrils, a frequent though slight cough, a shortness of breath, or rather panting, a flushing of the cheeks, great languor with disposition to sleep, and a quick small irregular pulse.... It was succeeded in February by the hooping cough."

Measles, which is usually a catarrhal malady, has undoubtedly been followed by whooping-cough in many individual cases and in epidemics as a whole; and it may be that there is a closer association of whooping-cough with measles than with any other

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[1] *Changes in the Air, &c....in Barbadoes.* Lond. 1760.

infectious disease. In the table on p. 647, the deaths by whooping cough in London from 1731 to 1830 have been reduced to ratios per cent. of the deaths from all causes, in a parallel column with the ratios of measles; it will be seen that the increase of both is equally remarkable towards the end of the table. But the Glasgow ratios abstracted by Watt show no such decided increase of whooping-cough from 1783 to 1812, side by side with the astonishing increase of measles; while his annual bills for the same period show that there were many deaths from whooping-cough in Glasgow for years before measles began to replace smallpox or to divide the mortality with it. The first high monthly mortalities from whooping-cough in Watt's bills were from November, 1785, to the end of 1786; but there had been so little measles for twenty-four months before that epidemic began, that only one death from it is recorded all the time. Again, the great measles epidemic of 1808 in Glasgow was indeed followed by many deaths from whooping-cough in 1809; but, while the height of the measles epidemic was in May and June, 1808, it was not until April, 1809, that whooping-cough began to cause many deaths.

Glasgow: Deaths by measles and whooping-cough.

	Whooping-cough	Measles		Whooping cough	Measles
1807			1809		
Nov.	18	2	Jan.	7	4
Dec.	18	1	Feb.	6	4
			March	7	2
1808			April	16	1
Jan.	10	2	May	22	4
Feb.	20	2	June	25	4
March	12	5	July	22	6
April	18	71	Aug.	15	2
May	9	259	Sept.	35	4
June	9	260	Oct.	23	1
July	2	118	Nov.	36	2
Aug.	2	32	Dec.	45	10
Sept.	2	22	1810		
Oct.	2	10	Jan.	33	4
Nov.	4	4	Feb.	32	4
Dec.	2	2	March	19	3

Whatever correspondence or relation there may be between measles and whooping-cough, (and it has been remarked by many in the ordinary way of experience), it eludes the method

of statistics[1]. As for the catarrhs of infants and children other than those which are part of the actual attack of measles or influenza, they are so common from year to year, and even from month to month, (perhaps coincident with teething, or with chicken-pox or other slight febrile disturbance), that a statistical study of whooping-cough in relation to them could lead only to an empirical, and possibly bewildering, result. It may be more useful to consider the antecedent probability of some such relationship, arising out of the pathology of the convulsive cough.

Whooping-cough is not only a paroxysmal cough coming on in convulsive fits at intervals, but the paroxysms, as they recur for many weeks, or, as they say in Japan, "for a hundred days," have none of the obvious occasions of coughing, such as catarrh of the mucous membrane, congestion of the lungs from hot or close air, irritation of the bronchial tubes from dusty particles or vapours, or the presence of tubercles in the substance of the lungs. Such irritants can, indeed, produce whooping-cough, as in the following instance of "artificial chincough" related by Watt:

> Two children having quarelled in their play, one of them thrust a handful of sawdust into the mouth of the other. Some of the sawdust passed into the windpipe. After a short time the child began to have violent convulsive fits of coughing, in which the whoop was very distinctly formed. Expectoration in the course of a few hours removed all the irritation, and the coughing thereupon ceased.

But in natural or ordinary whooping-cough there is no mechanical irritation, there is nothing to cough up, the reflex action, violent and paroxysmal though it be, has apparently no motive. I have, in another work, offered an original explanation of the paroxysmal cough of children as being the deferred reaction, the postponed liability, the stored-up memory, of some past catarrhal or otherwise irritated state of the respiratory organs, to which I refer without attempting to summarize it here[2].

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[1] In the Irish Decennial Summary for 1871–80 (*Suppl. to 17th Report of Reg.-Gen. Ireland*, 1884) it is said: "A general relation has been noticed by many observers between the prevalence of whooping-cough and measles, and there is no doubt that in many localities an epidemic of measles is frequently accompanied by or followed by a prevalence of whooping-cough. A comparison of the figures in Table XV. does not point to any very close relationship. Whooping-cough was a much more fatal disease than measles, but it is more than probable that measles was equally prevalent."

[2] *Illustrations of Unconscious Memory in Disease.* London, 1886 [1885]. Chapter VI. pp. 64–83.

The epidemicity of whooping-cough presents no more difficulty if the malady be viewed as the sequel or dregs of something else than if it be taken for an independent primary affection. The many infants and children that suffer from it together may have equally been suffering together from one or other of the various things of which it is assumed to be the sequel—influenza, measles, sore-throat, the bronchitis of rickets, simple bronchial catarrh of the winter, simple coryza. Again, it may be a secondary or residual affection with many, but a communicable disease to others. Much of the whooping-cough of an epidemic is believed by good authorities, such as Bouchut and Struges[1], to be simply mimetic, or a habit of coughing acquired by hearing other children coughing in a particular way, just as chorea is sometimes acquired in schools or hospital-wards through the mere spectacle of it. But it may be doubted whether much of the whooping-cough which swells the bills of mortality is acquired in that way. The children that die of it are probably most of them such as had only escaped dying of the measles or other infective disease, or of the non-specific catarrh, which had preceded the whooping-cough.

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[1] *Med. Times and Gaz.* 1885, II. p. 6.

CHAPTER VII.

SCARLATINA AND DIPHTHERIA.

SCARLATINA and diphtheria have to be taken together in a historical work for the reason that certain important epidemics of the 18th century, both in Britain and in the American colonies, which were indeed the first of the kind in modern English experience, cannot now be placed definitely under the one head or the other, nor divided between the two. It may be that this ambiguity lies actually in the complex or undifferentiated nature of the throat-distemper at that time, or that it arises out of the contemporary manner of making and recording observations upon the prevalent maladies of seasons. The older or Hippocratic method was not unlike the mason's rule of lead, said to have been in use in the island of Lesbos for measuring uneven stones; it took account of gradations, modifications, affinities, being careless of symmetry, of definitions or clean-cut nosological ideas, or the dividing lines of a classification. Sydenham was the great English exponent of this method; but, in one of his more discursive passages, he sketched out another method of describing diseases as if they were species or natural kinds[1]. He did no more than indicate this analogy, at the same time declining to put it in practice; so that Sauvages correctly described his great Nosology of 1763 as being constructed "juxta Sydenhami mentem et Botanicorum ordinem." The identification of scarlatina in its modern sense, including scarlatina simplex and scarlatina anginosa, falls really in the time of the nosologies in the generation following the work of Sauvages, although both the name and definition in the modern

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[1] Preface to 3rd ed. of *Obs. Med.*, Greenhill's ed. p. 16.

sense were used in England as early as 1749. On the other hand, the name and definition of diphtheria were little known until about the years 1856-59, when the form of throat-distemper which is now quite definitely joined to that name became suddenly common, having been almost unheard of for at least two generations before. The only English writer who has attempted to unravel the accounts of the 18th century epidemics of throat-disease was Dr Willan in his unfinished work on Cutaneous Diseases, 1808; he swept the whole of those epidemic types into the species of scarlatina, to which also he reduced the great Spanish epidemics of "garrotillo" in the 16th and 17th centuries. Whether he would have used so summary a method if he had seen the sudden return of diphtheria in 1856, may well be doubted; at all events the German writers who brought their erudition to bear upon the question of identity some thirty years ago have discovered true diphtheria among the 18th century throat-distempers, although no two of them agree as to which of these should be called diphtheria and which scarlatina anginosa. It is one advantage of a historical method that the complexities of things may be stated just as they are, with due criticism, naturally, of the matters of fact and of the relative credit of observers. The result is more an impression than a logical conclusion,—an impression which will take a colour from the pre-existing views or theoretical preferences of individual readers on such points as fixity of type or the incompetence of the earlier observers. An author who has puzzled over these difficulties in detail can hardly help having a tolerably definite impression of the real state of the case; and I do not seek to conceal mine, namely, that scarlatina anginosa and diphtheria were not in nature so sharply differentiated in the 18th century as they have been since 1856.

The significant name of *pestis gutturuosa* or plague of the throat is given by the St Albans chronicler to the great pestilence, or some part of it, in 1315-16, during one of the worst periods of famine and murrain in the whole English history. But those two words being all that we have to base upon, there is no use speculating whether the disease was scarlatina anginosa, or diphtheria, or something different from either. This is perhaps the only reference to an epidemic throat-distemper in England for several centuries in which bubo-plague was the grand infection. In the popular medical

handbooks of the Tudor period one naturally looks for scarlatina among the diseases of children. In Elyot's *Castel of Health* (1541), "the purpyles" is mentioned among children's maladies in company with smallpox and measles, and the same name is in the London bills of mortality from their beginning in 1629, although it does not appear whether the deaths assigned to it were of children or adults. Perhaps the most common use of purples in the 17th and 18th centuries was for a form of childbed fever often attended with discoloured miliary vesicles. In Scotland, according to Sibbald (1684), "the fevers called purple" were any fevers, even measles or smallpox, in which livid or dark spots occurred as an occasional thing. Unless a few scarlatinal deaths are included under "purples" in the London bills (they could not have been many in any case), there is no other evidence of their existence until 1703, when the entry of scarlet fever appears for the first time, with seven deaths to it in the year. The heading remains in the bills until 1730 (the deaths never more than one figure), after which it is merged with fevers in general. The same indications of the insignificance of scarlatina among the causes of death in the 17th century may be got from the medical writers in London.

Sydenham introduced into the third edition (1675) of his *Observationes Medicae* a short chapter entitled "Febris Scarlatina[1]." It was a disease that might occur at any time of the year, but occurred mostly in the end of summer, sometimes infesting whole families, the children more than the elders. It began with a rigor, as other fevers did, the malaise being but slight. Then the whole skin became interspersed with small red spots, more numerous, broader, redder and less uniform than in measles; they persisted for two or three days and then vanished, and, as the cuticle returned to its natural state, there were successive desquamations of fine branny scales, which he compares elsewhere to those following the measles of 1670. Sydenham took it to be a moderate effervescence of the blood from the heat of the summer just over, or from some such excitement. It was a mild affair, not calling for blood-letting nor cardiac remedies, and requiring no other regimen than abstinence from flesh and spirituous liquors, and that the patient should keep in doors, but not all day in bed. The disease, he says, amounted to hardly more than a name (*hoc morbi nomen*,

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[1] *Sydenhami Opera*, ed. Greenhill, 1844, p. 243.

vix enim altius assurgit); but it appears that it was sometimes fatal; and in those cases Sydenham was inclined, after his wont, to blame the fussiness of the medical attendant (*nimia medici diligentia*). If convulsions or coma preceded the eruption, a large epispastic should be applied to the back of the neck and paregoric administered. Whether Sydenham was describing true scarlatina simplex, or a "scarlatiniform variety of contagious roseola," it is from him that we derive the name of scarlatina by continuous usage to the present time[1].

A few years after Sydenham had thus described scarlatina, Sir Robert Sibbald, physician and naturalist of Edinburgh, professed to have discovered the same as a new species of disease. "Just as the luxury of men," he says, "increases every day, so there grow up new diseases, if not unknown to former generations, yet untreated of by them. Nor is this surprising, since new depravations of the humours arise from unwonted diets and from various mixtures of the same. Among the many diseases which owe their origin to this age, there has been most recently (*nuperrime*) observed a fever which is called *Scarlatina*, from the carmine colour (named by our people in the vernacular *scarlet*) with which almost the whole skin is tinged. Of this disease the observations are not so many that an accurate theory can be delivered or a method of cure constructed." He proceeds to append one case—a child of eight, daughter of one of the senators of the College of Justice, who fell ill with redness of the face (thought at first to indicate smallpox coming on), became delirious and restless, then had the redness all over, which disappeared and left the child well about the fifth day. He had heard from some of his colleagues that the scarlet rash was sometimes interspersed with vesicles—perhaps the *miliaria* so much in evidence a generation or two later. In adults, Sibbald had seen the cuticle fall from nearly the whole body. But extremely few (*paucissimi*) had died of this fever. Like Sydenham, he omits to mention sore-throat and dropsy[2].

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[1] Maton, *Med. Trans. Col. Phys.* V., having seen an extensive epidemic attended by a red rash in one of the great public schools, was disposed to erect it into a new type of roseola, owing to its mildness, while he admitted that it was the same as Sydenham's scarlatina simplex. Macmichael (*New View of the Infection of Scarlet Fever*, 1822, p. 78) thought that this was "rather a proof of extreme refinement," and that there was no need to give it a new designation. Gee, *Brit. Med. Journ.*, 1883, II. 236, cites this "refinement" of Maton's as one of the noteworthy things in the history of the diseases of children in this country.

[2] Sir Robert Sibbald, M.D., *Scotia Illustrata, sive Prodromus Historiae Naturalis.* Edin. 1684. Lib. II. cap. 5, p. 55.

Another 17th century reference is by Morton, who practised in London, in Newgate Street, from about 1667 to the end of the century, and was frequently called to consult with apothecaries or other physicians in cases of sickness in middle-class families. In the second volume of his *Pyretologia*, published in 1694, he has a chapter "De Morbillis et Febre Scarlatina," and a separate chapter "De Febre Scarlatina." His position towards scarlet fever is peculiar. He uses the name, he says, in deference to the common consent of physicians, but, for his own part, he thinks scarlatina different from measles only in the form of the rash, so-called scarlatina being confluent measles just as there is a confluent smallpox. Except in that sense he sees no reason for retaining scarlatina in the catalogue of diseases. Both arise from the same cause, both have hacking cough, heaviness of the brain, sneezing, diarrhoea; the single difference is that in scarlatina the rash is continuous. He gives eleven cases, most of which are clearly enough cases of measles; but the fourth case, that of his own daughter, Marcia, aged seven, in 1689, "in quo febris dicta Scarlatina, tempore praesertim aestivo, quadantenus publice grassabatur" had no cough, nor redness of the eyes, nor diarrhoea, nor any other catarrhal symptoms (such as her sister had in 1685), but on the fourth day a continuous scarlet rash over the whole skin, which ended, not in a desquamation of fine branny scales, but in parchment-like peeling. The eleventh instance is complex enough to show that Morton had some reason, at that early stage in the history of scarlatina, for hesitating to make the disease a distinct type under a name of its own.

About midsummer, 1689, he was called to the house of his friend Mr Hook, merchant, of Pye Alley, Fenchurch Street, and found the whole household, three young girls, one little boy, and their aunt Mrs Barnardiston, a matron aged seventy, all suffering from the effects of some infection of as deleterious a kind as synochus, the symptoms being hacking cough, coma, delirium, and other signs of malignity. But on the 4th, 5th, or 6th day, each had a scarlatinal rash all over the skin, which lasted until the 7th, 8th or 10th day. Two of the girls, and the boy, had "on the 4th or 5th day of the efflorescence" extensive parotid swellings, difficulty of swallowing, vibrating arteries, and other urgent symptoms, for which they were blooded. The parotid abscesses burst, and discharged a copious acrid, corrosive pus by the nostrils, ears and throat, for the space of thirty days, during which the patients gradually got well. The third girl had, on the 3rd or 4th day of the rash, a painful swelling in the left armpit, not unlike a bubo; she also was blooded, and recovered completely, the swelling having broken and discharged pus for many days. The case of the aunt, aged seventy, was somewhat different; she neglected her medicines, acquired a "carcinoma"

or slough over the pubes, which became gangrenous, recovered with difficulty, and lived three years longer.

Morton calls these cases a veritable *pestis* or plague; and he goes on in the same context to say: "what swellings have I seen of the uvula, fauces, nares, and how protracted! At other times, what turgid lips, covered with sordid crusts and ulcerated!"—instancing the child of Mr Blaney, who had these symptoms long after the efflorescence, together with fever and coma[1]. These cases, all given under the eleventh history illustrating the chapter on Scarlatina, are perhaps not different from those which Huxham, next in order, described in 1735, but not under the same name. It would appear from a reference in Hamilton's essay on Miliary Fever, published in 1710, that scarlet fever continued to be seen in London: "If, in a scarlet fever, miliary pustules should arise, dying away with a red colour, they promise safety[2]."

Several of the annalists of epidemic constitutions agree as to fatal anginas in the year 1727, with an exanthem of the miliary kind. Wintringham, of York, mentions the two things apart—in one place a putrid fever with cutaneous eruptions of a fuscous colour, sometimes dry, sometimes filled with a clear serum; in another place, "about this time many anginas were prevalent, attended with extreme suffocation, which proved fatal unless they were speedily relieved." He mentions the same putrid fever in the summer of 1728, and again anginae. Hillary, who was then at Ripon, gives the same fever in 1727 (or perhaps in 1726) with miliary eruption, and chronicles "a fatal suffocative quinsey" in the winter of 1727–28, of which many died, especially those that had been reduced by the fever. Huxham's account of an epidemic malady of the throat and neck at Plymouth in January and February, 1728, might relate to mumps (which Hillary and an Edinburgh observer describe clearly enough under 1731); and under October, 1728, he describes an erysipelatous and petechial fever, often relieved by an eruption of red miliary vesicles accompanied by sweats, the same miliary fever being again common in the autumn of 1729. This association

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[1] Richard Morton, M.D. *Pyretologia.* 2 vols. London, 1692–94, II. 69.

[2] Engl. transl. 1737, p. 80. The reference by Dover (*Ancient Physician's Legacy*, 1732, p. 117), is almost in the words of Sydenham, his master: "This is a fever of a milder kind than the measles [of which latter he did not remember anyone's dying till about twenty-five years since], and does not want the assistance of a doctor. The skin seems to be universally inflamed, but the inflammation goes off in forty-eight hours."

of "putrid" fever with sore-throat became still more notable in the period 1750–60.

These anginas of 1727–28 are unimportant compared with the outbreak a few years later. We hear first from Edinburgh in June, 1733, of scarlet fever and sore throats frequent in several parts of the country near the city, and continuing all through the summer into the winter and spring of 1734[1]. Then in April, 1734, begins a series of important notes by Huxham at Plymouth[2]. In that month, he says, there began a certain anginose fever ("for so I shall call it"), raging more and more every day. It mostly affected children and young people. Among other symptoms were vomiting and diarrhoea, pain and swelling of the fauces, languor, anxiety, delirium or stupor, a favourable issue being attended with sweats and red pustules. In May it was raging worse, with more severe angina and most troublesome "aphthae." In June it was now miliary-pustular, and not seldom erysipelatous, while the throat was "less oppressed." On the 6th or 7th day the cuticle looked rough and broken as if thickly sprinkled with bran; at length the whole desquamated—sometimes the entire skin of the sole of the foot coming off. The more copious the rash, the better the chance for life. It was contagious, affecting several in the same house. In July it cut off several within six days of the onset. Huxham's references to this putrid miliary fever in Devon and Cornwall go on for some time, without farther mention of the throat complication. In April, 1735, "raro nunc adest strangulans faucium dolor, paucaeque nunc erumpunt pustulae." But, in September, 1736, he enters again, "febres miliares, scarlatinae, pustulosae," often attended with swelling of the parotid glands and of the fauces, and with profuse sweats.

The most important scene of fatal angina with rash in the same period (1734–35) was the North American colonies. Before coming to that remarkable outburst, I shall mention one curious coincident outbreak in the island of Barbados. Dr Warren, who occupies his pen chiefly with yellow fever, says[3]: "In this space of time [1734 to 1738], there arose here a few other diseases, that were really epidemical and of the contagious kind too, few escaping them in families where they had once got

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[1] *Edin. Med. Essays and Obs.* III. 26.

[2] *Obs. de aere et morb. epid.*

[3] H. Warren, M.D., *On the Malignant Fever in Barbados.* London, 1740, p. 73.

a footing. The first was an obstinate and ill-favour'd erysipelatous quinsey. The second a very anomalous scarlet fever, in which almost all the skin, even of the hands and feet, peeled off,"—just as Huxham described for Devonshire.

It is beyond our purpose to include the evidence from foreign countries; but it may be noted in this context that Le Cat, in tracing the antecedents of the great Rouen fever in his paper of 1754, refers to many fatal anginas in that city about twenty years before[1]. Thus we find about the year 1735 evidence of the beginning of a remarkable "constitution" of throat-disease both in the old world and in the new. But the facts in America stand out with peculiar prominence, and shall be given on the threshold of the subject as fully as possible.

The Throat-distemper of New England, 1735–36.

The accounts of the great wave of "throat-distemper" that spread over the towns and villages of New England in 1735 are singularly clear and even numerically precise. The arrival of this sickness is one of the most definite incidents in the whole history of e[illegible]: it was hardly possible for the common belief, whether popular or professional, to have been mistaken about it. Just a hundred years had passed since the first settlement of the Puritans on Massachusetts Bay and along the Connecticut river; Boston had grown to a town of some 12,000 inhabitants, and many small towns and townships had sprung up along the coast and in the interior. The population was still sparse, although it was growing rapidly from within; it is difficult to believe that even the largest towns could then have deserved the strictures which Noah Webster passed upon them two generations later[2].

In the mother country at that time, smallpox was the great infectious malady of infancy and childhood. It was not unknown in the colonies, Boston having had epidemics in 1721,

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[1] Le Cat, in *Phil. Trans.* XLIX. 49: In 1736 and 1737, a prevalence of gangrenous sore-throats which chiefly attacked children. They reappeared in 1748 in young persons of the first distinction, not only at Rouen, but also at St Cyr, near Versailles, and at Paris.

[2] Webster, *Brief History of Epidemick and Pestilential Diseases.* Hartford, 1799, II. 253: "Away, then, with crowded cities—the thirty feet lots and alleys, the artificial reservoirs of filth, the hot-beds of atmospheric poison! Such are our cities—they are great prisons, built with immense labour to breed infection and hurrying mankind prematurely to the grave."

1730 and 1752, and Charleston an epidemic in 1738 after an almost free interval of thirty years. Even in the chief cities of the colonies such epidemics were only occasional, affecting adults and adolescents perhaps more than infants and as much as children; while in such a town as Hampton, for which the register was well kept from 1735, it is known that there were no smallpox deaths in the twenty years following, or until the period 1755–63, when four died of the disease, and that only one death from it occurred in the next recorded period of ten years, 1767 to 1776. It was in these circumstances of a growing population, almost untouched, at least in the inland towns, by the great infantile infectious malady of the old country, that the throat-distemper broke out and raged in the manner now to be described.

The disease "did emerge," as Douglass says, on the 20th of May, 1735, at Kingston township, some fifty miles to the east of Boston[1]. The first child seized died in three days; in about a week after three children in a family some four miles distant were successively seized, and all died on the third day; it continued to spread through the township, and Douglass was informed that of the first forty cases none recovered. It was vulgarly called the "throat illness" or "plagüe in the throat." Some died quickly as if from prostration, but most had "a symptomatic affection of the fauces or neck: that is, a sphacelation or corrosive ulceration in the fauces, or an infiltration and tumefaction in the chops and forepart of the neck, so turgid as to bring all upon a level between the chin and sternum, occasioning a strangulation of the patient in a very short time." In August it was at Exeter, a town six miles distant, but it did not appear at Chester, six miles to the westward, until October. After the first fatal outburst in Kingston township it became somewhat milder; but in the country districts of New Hampshire it was fatal to 1 in 3, or 1 in 4 of the sick, and in scarce any place to less than 1 in 6. This average was made up by its excessive fatality in some families; Boynton of Newbury Falls lost his eight children; at Hampton Falls twenty-seven died in five families. The following table, compiled by Fitch, minister of Portsmouth, shows the deaths from it in various

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[1] W. Douglass, M.D., *The Practical History of a New Epidemical Eruptive Miliary Fever, with an Angina Ulcusculosa, which prevailed in New England in the years* 1735 *and* 1736. Boston, N.E. 1736. This rare essay was reprinted in the *New England Journ. of Med. and Surg.* XIV. 1 (Jan. 1825).

towns and townships of New Hampshire during fourteen months from May, 1735, to 26 July, 1736, with the ages[1]:

Deaths from the throat-distemper in 14 *months*, 1735–36 (Fitch).

	Under ten years	Ten to twenty	Twenty to thirty	Thirty to forty	Above forty	Total
Portsmouth	81	15	1	—	2	99
Dover	77	8	3	—	—	88
Hampton	37	8	8	1	1	55
Hampton Falls	160	40	9	1	—	220
Exeter	105	18	4	—	—	127
Newcastle	11	—	—	—	—	11
Gosport	34	2	—	—	1	37
Rye	34	10	—	—	—	44
Greenland	13	2	3	—	—	18
Newington	16	5	—	—	—	21
Newmarket	20	1	—	1	—	22
Stretham	18	—	—	—	—	18
Kingston	96	15	1	1	—	113
Durham	79	15	6	—	—	100
Chester	21	—	—	—	—	21
	802	139	35	4	4	984

The meaning of these figures in the townships of New Hampshire will appear from the case of Hampton. In the year 1736 its burials from all causes were 69, and its baptisms 50; while the throat-distemper alone, during fourteen months of that and the previous year, cut off 55. As we have seen, Hampton had no smallpox to ravage its children; but the throat-disease of 1735–36 had almost the same effect as the occasional disastrous epidemics of smallpox had upon English towns of a corresponding population or annual average of births.

This plague in the throat attacked the children of the most sequestered houses, especially those situated near rivers or lakes. It was least fatal to those who lived well, both Douglass and Colden assigning the salt diet, and other things likely to produce *psora*, as the reason of its greater severity. In the country districts or townships, in which the fatalities were most numerous, it would appear that an eruption, scarlet or other, was not only not the rule but even something of a rarity. Douglass, who was familiar with the exanthem in the Boston cases, assigns its absence in the country to a mistaken evacuant treatment, by which "the laudable and salutary cuticular eruption has been so perverted as to be noticeable only in a few, and in these it was called a scarlet fever."

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[1] In Belknap's *History of New Hampshire.* Boston, 1791.

When the disease broke out in due course at Boston it proved much less malignant than in the country. The first case, on the 20th August, had white specks in the throat and an efflorescence of the skin. A few more soon followed in the same locality, of which none were fatal; they had soreness in the throat, the tonsils swelled and speckt, the uvula relaxed, a slight fever, a flush in the face and an erysipelas-like efflorescence on the neck and extremities. The first death was not until October, the disease becoming more frequent and more fatal in November, and reaching its worst in the second week of March, when the burials from all causes rose to 24, the average per week in an ordinary season being 10. The fatalities in Boston were so few for the enormous number of cases that many could scarce be persuaded that it was the same disease as in the Townships. In the corresponding weeks (1 Oct. to 11 May) of eight ordinary years preceding, the average deaths were 268, whites and slaves; during this sickness they were 382, or an excess of 114, which were probably all due to the throat-distemper, as many as 76 fatal cases having come to the knowledge of Douglass himself. He estimates the whole number of attacks at 4000, giving a ratio of one death in thirty-five cases; but it is clear that very slight cases of sore-throat were counted in.

The fatal cases in Boston seem to have shown a great range of malignant symptoms: "We have anatomically inspected persons who died of it with so intense a f[illegible] from the violence of the disease that some practitioners could not continue in the room." Among the bad symptoms were the coming and going of the miliary eruption, dark livid colour of the same, the vesicles large, distinct and pale, like crystalline smallpox; an ichorous discharge from the nose; many mucous linings expectorated, resembling the cuticle raised by blisters; pus brought up where no sloughs could be seen in the fauces; extension to the bronchi, with symptoms of a New England quinsey (? croup); in some children, spreading ulcers behind the ears; the tongue throwing off a complete slough with marks of the papillae. Among the after-effects in severe cases were anasarca or dropsy of the skin, haemorrhages, urtications, serpiginous eruptions chiefly in the face, purulent pustules, boils, or imposthumations in the groins, armpits and other parts of the body, indurations of the front of the neck (the same by which many in the country were suffocated, and a few in Boston), hysteric symptoms in women, and epileptic fits.

Douglass gives special attention to the eruption, which he calls miliary in his title-page. Some had a sore-throat without any eruption, and a very few had an eruption with no affection of the throat beyond the tonsils and uvula swollen. In some the eruption preceded the soreness of the throat, in some the two came together, but in the general case the eruption was a little later than the affection in the throat. The ordinary course was a chill and shivering, spasmodic wandering pains, vomiting or at least nausea, pain, swelling and redness of the tonsils and uvula, with some white specks: then followed a flush in the face, with some miliary eruptions,

attended by a benign mild fever; soon after, the miliary efflorescence appears on the neck, chest and extremities; on the third or fourth day the rash is at its height and well defined, with fair intervals; the flushing goes off gradually with a general itching, and in a day or two more the cuticle scales or peels off, especially in the extremities. At the same time the cream-coloured sloughs or specks on the fauces become loose and are cast off, and the swelling goes down. Where the miliary eruptions were considerable, the extremities peeled in scraps or strips like *exuviae*; in one or two, the nails of the fingers and toes were shed. Some who had little or no obvious eruption underwent a scaling or peeling of the cuticle.

The epidemic having spent its force upon the New England towns from the autumn of 1735 until the summer of 1736, gradually travelled westward, and was two years in reaching the Hudson River, distant only two hundred miles in a straight line from Kingston, where it first appeared in May, 1735. It continued its progress, with some interruptions, until it spread over the colonies from Pemaquid in 44° N. latitude to Carolina; and as Douglass, writing in 1736, had heard that "it is in our West India Islands," it was probably the same disease that Warren recorded for Barbados in the same years under the names of "an obstinate and ill-favour'd erysipelatous quinsey," and "a very anomalous scarlet fever"; and the same as the epidemic "sore-throats" that another records for the Virgin Islands in 1737[1].

Although it usually attacked several children in the same house, it did not seem to be communicable, like smallpox, from person to person or by the medium of infected clothes. The Boston physicians held a consultation on the point, and published their opinion that it proceeded entirely from "some occult quality of the air."

This was the first appearance of sore-throat with efflorescence of the skin among the English colonists of North America. For at least two generations after, the disease remained in the country, breaking out unaccountably from time to time at one place or another and often cutting off many children, but never so malignantly as at first[2]. Colden, writing from near New York in 1753, says:[3]

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[1] *Gent. Magaz.* Feb. 1752, p. 73.

[2] The account by Kearsley, of Philadelphia, written about 1769 (*Gent. Magaz.* XXXIX. 251), refers to a great epidemic of throat-disease in New England in the spring, summer and autumn of 1746; but the date is almost certainly a mistake for 1736, as no such epidemic is known on contemporary authority.

[3] Cadwallader Colden, M.D. "Letter to Dr Fothergill on the Throat Distemper," dated New York, 1 Oct. 1753, in *Med. Obs. and Inquiries*, I. 211.

> "Ever since I came into this part of the country where I live (now about fourteen years), it frequently breaks out in different families and places, without any previous observable cause, but does not spread as it did at first. Sometimes a few only have it in a considerable neighbourhood. It seems as if some seeds or leaven or secret cause remains wherever it goes; for I hear of the like observations in other parts of the country. Several have been observed to have it more than once... In different years and different persons the symptoms are various. In some seasons it has been accompanied with miliary eruptions all over the skin; and at such times the symptoms about the throat have been mild and the disease generally without danger if not ill treated. Some have had sores, like those on the tonsils, with a corrosive humour behind their ears, on the private and other parts of the body, sometimes without any ulceration in the throat" (case given of a child of ten with sores on the pudenda).

It was in 1754, the very next year after Colden wrote as above, that the second great epidemic of throat-distemper arose in New Hampshire and the neighbouring parts of Massachusetts. The figures of its mortality which have been preserved for the town of Hampton, New Hampshire, may serve as a sample of its prevalence subsequent to the original explosion of 1735–36. In the first epidemic, 1735–36, there died at Hampton of the throat-distemper, 55 persons, mostly children. In the second, from January 1754 to July 1755, there died of it 51 persons. The deaths from all causes in those two years were 85, and the births 70.

The following table shows the proportion of deaths from throat-distemper [illegible] the deaths from all causes in Hampton from 1735 to 1791[1].

Period	Deaths from throat-distemper	Deaths from all causes
1735–44	91	216
1745–54	60	221
1755–63	30	187
1764–66	—	—
1767–76	3	115
1777–86	7	99
1787–91	0	46

It was once more described, for New York city, by Dr Samuel Bard in 1771[2]. He identifies it with the disease described by Douglass in 1735, and gives an account of it on the whole like Colden's.

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[1] Belknap, III. 421.

[2] Samuel Bard, M.D. "An Inquiry into the Nature, Cause and Cure of the Angina Suffocativa, or Sore throat Distemper, as it is commonly called by the inhabitants of this city and colony." *Trans. Amer. Philos. Soc.* I. (1769–1771). Philad. 1771, p. 322. What purports to be a translation of this, is given in Reutte's *Recueil d'Obs. sur le Croup* (Paris, 1810), the name of "croup" being introduced into the title, and some strange liberties taken with the text.

It was "uncommon and very dangerous," mostly a malady of children under ten. They drooped for several days, had a watery eye, then a bloated livid countenance, and a few red eruptions here and there on the face. This went on for three or four days, the throat meanwhile showing white specks on the tonsils. Sudden and great prostration ensued, with a peculiar hollow cough and tone of voice, or loss of voice, constant fever, especially nocturnal, and a degree of drowsiness. In fatal cases there was great restlessness and tossing of the limbs towards the end. In one family all the seven children took it one after another; three died out of the four elder; the three younger recovered, having had ulceration behind the ears, which continued for several weeks and rendered an acrid, corrosive ichor. Many other children had these ulcerations behind the ears, sometimes with swelling of the parotid and sublingual glands. The same ulcerations might occur also "in different parts of the body." Sloughs of the fauces and epiglottis extended as a membranous exudation into the trachea. Two cases occurred in women, one of them having assisted to lay out two children dead of the distemper.

The last time of its general spreading (within the period covered by Belknap's *History of New Hampshire*, 1791) was in 1784–85–86 and –87. It was first seen at Sandford in the county of York, and thence diffused itself very slowly through most of the towns of New England; but its virulence and the mortality which it caused were comparatively small[1].

Angina maligna in England from 1739.

Although there had been an extensive prevalence of angina with miliary or scarlet or erysipelatous rash in Devon and Cornwall in 1734 and following years, a slight amount of sore-throat with scarlet fever in and near Edinburgh in 1733, a great prevalence of throat-distemper with scarlet or miliary rash in the North American colonies in 1735–37, and an ill-favoured erysipelatous quinsy as well as an anomalous scarlet fever in Barbados, St Christopher, &c., during the same period, yet it

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[1] The impression made upon modern historians by these American accounts of the throat-distemper has not always been the same. Hecker finds in the malady described by Douglass the form of *Frieselbräune*, or miliary diphtheria, a somewhat rare and sporadic malady; in the account by Bard, he finds *häutige Brandbräune*, or membranous angina maligna; while he finds in an account by Chalmers for Charleston, S. Carolina, in 1770, a third variety, *Friesel-Scharlachbräune*, or miliary scarlet angina. Again, Jaffe finds in the account by Bard "many analogies with the diphtheria of our own day." Hirsch identifies the throat-distemper of Douglass and Colden as "exquisite scarlet fever" and the disease described by Bard as diphtheria. Häser identifies the epidemic described by Douglass as diphtheria. Bard himself did not doubt that the disease which he saw in New York previous to 1771 was the same that Douglass saw at Boston in 1735–36. Hecker, *Geschichte der neueren Heilkunde.* Bk. I. chap. 8. Max Jaffe, "Die Diphtherie in epidemiol. u. nosol. Beziehung, &c." Original paper in *Schmidt's Jahrbücher*, CXIII. (1862), p. 97. Hirsch, 1st ed. of *Handb. der histor. geogr. Pathol.* I. 237, note 6; II. 125, note 4; and 2nd ed. III. 80. Eng. transl. Häser, *Geschichte, &c.* III. 471.

was not until the end of the year 1739 that cases more or less similar occurred in London. The incident that first drew attention to the throat-distemper in the capital was the death of the two sons of Henry Pelham, the colleague of his relative the Duke of Newcastle in the premiership[1]. Horace Walpole, writing twenty years after concerning similar calamities in the family of the Earl of Bessborough, says that not only Mr Pelham's two sons, but also two daughters and a daughter of the Duke of Rutland all died together. Chandler, writing in 1761, says that he well remembered the disease at the end of 1739. Early in 1740 he had in his own practice as an apothecary two cases of children sick in one family; the first died, and as he was at a loss to account for the death, there being "something in the whole of the case quite new and unknown to me," he called in Dr Letherland to see the other, who declared that the child would die also, as it did. Letherland then spoke to Chandler of the death of the two Pelhams shortly before, "of the alarm it caused all over this great city, both from its novelty and fatality," and of his own care and pains in turning over ancient and modern writers to see if he could trace any footsteps of this remarkable and terrible disease: at last, after long search, he had been so happy as to discover the identical disease circumstantially described in the Spanish writers[2].

The identification of the English throat-distemper of the 18th century with the *garrotillo* of Spain in the 16th and 17th centuries was thus undoubtedly due to Letherland, so far as English learning was concerned, and he received due credit for it in the Harveian Oration at the College of Physicians on the first occasion after his death[3].

Chandler thus described the state of the disease at its first breaking out in 1739:

> "The first and common appearances are feverishness, sickness, vomiting or purging; the proper and diagnostic signs which follow are an ulcerous slough in some part of the fauces, discharging a fœtid matter....The nostrils are glandered....From the absorption of the fœtid pus, the blood is contami-

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[1] *Gent. Magaz.* IX. Nov. 1739, p. 606:—Died, "Nov. 27, the eldest and youngest son of Henry Pelham, Esq. of sore throats."

[2] John Chandler, F.R.S., *A Treatise of the Disease called a Cold. Also a Short Description of the Genuine nature and seat of the Putrid Sore-Throat.* London, 1761, p. 55.

[3] Munk, *Roll of the College of Physicians.* Fothergill cites Spanish and other foreign writers on *garrotillo* in the historical introduction to his essay on the Sore-Throat (1748), without mentioning the fact that Letherland had been before him in that field.

nated; crimson efflorescences and small putrid pustules break out on the skin of the neck and breast, a quick depressed pulse, with a tendency rather to stupor than violent perturbations accompanying all, and, if not relieved, terminate in delirium, languor, clammy sweats and death."

Fothergill, whose name is so closely associated with the outbreak of gangrenous sore-throat a few years after, makes little of the earlier epidemic in London; besides the cases in the Pelham family and some others in the same part of the town, there were, he says, very few observed, so that "the disease and the remembrance of it"—including Letherland's priority—"seemed to vanish altogether." The winter of 1739–40, in which these cases had occurred, was one of intense frost and the beginning of a two years' sickly period in which typhus in Britain, dysentery and typhus in Ireland, reached a height unprecedented in the 18th century.

An epidemic of Throat-disease in Ireland, 1743.

In Ireland the dysenteries, typhus and relapsing fevers, attendant on and following the famine, were hardly over when the plague of the throat began among the children. It was seen first in the summer of 1743 (an influenza having preceded in May and June), it raged through the autumn and winter, and was not extinct for many years after. There were but few instances of it in Dublin, but it was prevalent in the adjoining counties, and exceedingly so in Wicklow, Carlow, Queen's County, Kilkenny, Cavan, Roscommon, Leitrim, Sligo "and perhaps many others, carrying off incredible numbers, and sweeping away the children of whole villages in a few days." The country doctors, who knew most of it, were not apt to record their experiences; so that the following account, which Rutty extracted from Dr Molloy, is all the record that remains of an epidemic concerning which one would wish to have known more[1]:

"It is peculiar to children, and those chiefly of from a month to three, four, five, six, eight or nine years old. They commonly for a day or two, or more, had a little hoarseness, sometimes a little cough; then in an instant they were seized with a great suffocation lasting a minute or two, and their face became livid; they have frequent returns of these fits of suffocation like asthmatic persons. The said suffocation is ever followed by one symptom which continues till they die, viz. a prodigious rattling in the upper part of

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[1] John Rutty, M.D., *Chronological History of the Weather and Seasons, and prevailing Diseases in Dublin, during forty years*. London, 1770, p. 108.

the aspera arteria [windpipe] resembling that sound which attends colds when there is phlegm that cannot be got up. It is scarce sensible when they are awake but very great when they are asleep."

While there is little in this account to suggest the malignant sore-throat, and no mention of a miliary or scarlet rash, yet Rutty made no doubt that it was the malignant angina, comparing it rather to that described by Starr for Cornwall in 1748 than to that of Fothergill's description. He adds, from some other source of information, that children had generally clammy sweats upon them, with foetor of the breath. Many died in twenty-four hours; none lived above five days. Some had tumours behind the ears, which mortified. Many had a prodigious weeping behind the ears, which was very corrosive. A case is given of a child recovering after a profuse sweat, which suggested diaphoretic treatment by warm baths and sack-whey. Swellings of the tonsils and uvula were not observed.

It will be convenient to give here what remains to be said of the 18th century history of sore-throat in Ireland. In 1744 Rutty enters "mortal anginas" in Dublin. In March, 1751, tumours of the face, jaws, and throat, following an epidemic among horses in December, 1750. In the spring of 1752 "the pestilential angina" made great havoc among children. In the spring of 1755, "the gangrenous sore-throat" (same as in 1743) was fatal to some children. In the winter of 1759—60 he records "scarlet fever," and a singular form of the same in May, 1762, noticed under Influenza (p. 356). This must serve for the Irish experiences, although it is far from satisfactory. But it should be added that Dr James Sims, of Tyrone, who came to London afterwards and there wrote on the Scarlatina Anginosa (1786), says in an account of his Irish practice: "During all my practice here I have not seen one instance of the malignant ulcerous sore-throat as described by authors" (*op. cit.* 1773, p. 86).

Malignant Sore-throat in Cornwall, 1748.

Dr Starr, of Liskeard, calls the Cornish throat-disease the Morbus Strangulatorius. Writing in January, 1750, he said it had raged in several parts of Cornwall "within a few years," with great severity[1]: "Many parishes have felt its cruelty, and whole families of children been swept off: few, very few, have escaped." Cases given by himself belong to the year 1748; and Huxham, who did not meet with it at Plymouth until 1750–51, says that it had been raging with great fatality for a year or two before in and about Lostwithiel, St Austel, Fowey and Liskeard. In the account of the Cornish epidemic the emphasis falls upon

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[1] John Starr, M.D., "Account of the Morbus Strangulatorius." *Phil. Trans.* XLVI. 435, dated Liskeard, Jan. 10, $17\frac{49}{50}$.

the affection of the larynx and trachea; while there are so many other symptoms enumerated, including eruptions and brawny swelling of the neck, that it is clearly impossible to distinguish between exanthematous fever with sore-throat and laryngeal diphtheria pure and simple. Starr says: "Dr Fothergill's sore-throat with ulcers and Dr Cotton's St Albans scarlet fever are, in my opinion, but its shadows."

The symptoms generally pointed to the glottis.

Agonized breathing for a time was followed by the spitting up of jelly-like, glairy and somewhat transparent matter, mixed with white opaque thready matter, which might resemble more or less a rotten body or slough. The paroxysm returned, and the patient either died suddenly or sank away gradually, and died worn out, with or without convulsions. A plate is given of a whitish membrane loosened from the velum by means of hydrochloric acid on a silver probe; it was not a slough, but a strong tenacious membrane which would bear handling and stretching without breaking. In the same case, the child's father afterwards pulled from the mouth a complete cast of the trachea including the bifurcation of the bronchi, of which a figure is given: "what sweated from it was as sticking as bird-lime"; he lived twenty-one hours after this second cast was drawn from him and died somewhat suddenly in his perfect senses. Such formations Starr clearly believed to be the essence of the disease; but he gives many variations of it. The train of symptoms was not the same in every subject: "Some, I am informed, have had corrosive pustules in the groin and about the anus, eating quick and deep, and threatening a mortification even in the beginning [as Colden described for the sore-throat in New York State]. Others after a few days' illness have had numbers of the worst and deepest petechiae break out in various parts of their body: such I have not seen." But he gives cases of his own at Liskeard in 1748: "A child here and there had red pustules which broke out in the nape of the neck and threw off a surprising quantity of thin transparent ichor"; these pustules sloughed when poulticed; in another case sloughs followed where blisters had been applied to the neck and arm. Many had swelling of the tonsils, parotids, submaxillary and sublingual glands. A few had oedema from the chin to the thyroid, and up the side of the face. In one case, a tumour of the fauces broke and yielded some ounces of coffee-coloured foetid matter, to the patient's relief and ultimate recovery. Not a few had gangrenous sloughs in the mouth, which formed quickly. Some had foetor of the breath as an early symptom, but others had it not. Some were merely feverish and hoarse.

When Huxham came to describe the disease at Plymouth a year or two later, he laid the emphasis on other symptoms than those mostly dwelt upon by Starr, describing really a sloughing sore-throat with rash. But he has this also: "The windpipe itself was sometimes much corroded by it, and pieces of its internal membrane were spit up, with much blood and corruption; and the patients lingered on for a considerable time, and at length died tabid."

Fothergill's Sore-throat with Ulcers, 1746–48.

Meanwhile we have to overtake Fothergill's history of the ulcerous sore-throat in or near London[1]. It broke out at Bromley, near Bow, Middlesex, in the winter of 1746 (Short says that it was in Sheffield in 1745). So many children died suddenly, some losing all and others the greater part of their families, that people were reminded of the plague.

It began with a chill and rigor, followed by heat. The throat became sore, and there were nausea, vomiting and purging. The face turned red and swollen, the eyes were inflamed and watery, the patient was restless, anxious and prostrated. The seizure was often in the forenoon, and in all cases the symptoms became much worse towards night, to be relieved by a sweat in the morning, as in an intermittent fever. The uvula, tonsils, velum, inside of the cheeks, and the pharynx, were florid red, with a broad spot or patch, irregular in figure, of pale white colour like the blanched appearance of the gums when they have been pressed by the finger. Usually on the second day of the disease, the face, neck, breast and hands to the tips of the fingers became of a deep erysipelatous colour with perceptible swelling, the fingers in particular being often of so characteristic a tint as at once to suggest an examination of the throat. A great number of small pimples, of a deeper red than the skin around them, appear on the arms and other parts; they are larger and more prominent in those subjects, and in those parts of the same subject, where the redness is least intense, which is generally on the arms, the breast, and lower extremities. With the coming out of this rash, the sickness, vomiting and purging cease. The white spot or spots on the throat are now seen to be sloughs; they come first usually in the angles above the tonsils. They are not formed of any foreign matter covering the parts but are real mortifications of substance leaving an ulcer with corrosive discharge behind. The nocturnal exacerbation now takes the form of delirium and incoherent talking. The parotids are commonly swelled and painful; and if the disease be violent, the neck and throat are surrounded with a large oedematous tumour threatening suffocation. The pulse is 120, perhaps hard and small. The urine is at first crude and pale like whey; afterwards it is more yellow, as if from bile; and towards recovery it is turbid and deposits a "farinaceous" sediment. The initial purging having ceased, the bowels become irregular. The disease had no crisis, but in general, if the patient were to recover, the amendment began on the third, fourth or fifth day, when the redness disappeared and the sloughs in the throat were cast off.

Such is the main outline; the following symptoms have less general value.

At the outset, the patient complained of a putrid smell in the throat and nostrils, which caused nausea. The nostrils were often inflamed, yielding a sanies, and the inside of the lips covered with vesicles filled with an excoriating ichor. Some had the parts about the anus excoriated. Fothergill was inclined to think that either the excoriations or the ichor from them extended down the whole intestinal tract, and accounted for the purging,

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[1] John Fothergill, M.D., *An Account of the Sore Throat attended with Ulcers; a Disease which hath of late years appeared in this City and the parts adjacent.* London, 1748.

with other bowel symptoms, which sometimes remained for weeks after the primary disease and caused death by emaciation[1]. In some there was bleeding at the nose, or mouth, which might be fatal; in one case there was a like accident from the ear. Several cases are given in which there were no sloughs of the throat, but a dry glossy redness or lividity; in these cases, there was a general brawny swelling of the neck, a coldness of the hands and feet, involuntary evacuations, a glassy eye and certain death. Three of Fothergill's five briefly reported cases are of that variety. In one of them, a boy of 14 years, he says there was "deep redness of the face, hands and arms, with a plentiful eruption of small pimples, which induced those about him to apprehend it was a scarlet fever."

That is the only reference to a possible diagnosis of scarlet fever in the whole essay. In the New England throat-distemper of 1735, "scarlet fever" was in like manner the name given by the laity, and disapproved by the profession. Fothergill, adopting the erudition of Letherland, identified the ulcerous or gangrenous sore-throat of London in 1746–48 with the *garrotillo* of Spain in the 16th and 17th centuries, the famous throat-plague of Naples and other places in Italy and Sicily from 1618 onwards, and the "plague in the throat" mentioned by a traveller, Tournefort, in 1701 as occurring among children in the island of Milo, (Douglass having already identified the Levantine plague in the throat with the throat-distemper of New England in 1735.)

After the outbreak at Bromley and Bow in the winter of 1746, the ulcerous, or putrid or gangrenous angina continued in London and the villages near until the date of Fothergill's writing (1748). By credible accounts, he says, it was also "in several other parts of this nation." Short, of Rotherham, a professed epidemiologist, says that the malignant angina "never left Sheffield entirely since the year 1745[2]." Fothergill himself, in his monthly accounts of the weather and diseases of London from 1751 to 1755, refers to the sore-throat once or twice; thus, in October, 1751: "epidemic sore throat, in both children and adults"; and again, in July, 1755. "The ulcerated sore-throat likewise appears in many families, with the greatest part of its usual symptoms, but gives way without much difficulty, if no improper evacuations have been made, to the method heretofore recommended (XXI. 497)[3]."

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[1] Sir Thomas Watson (*Lectures*, II. 817), who mentions excoriations of the anus, carried Fothergill's idea of an absorption of the acrid matter to an extreme length in explaining the irritation of the alimentary canal in scarlet fever.

[2] Letter to Rutty, *Chronol. Hist.* 1770, p. 117.

[3] *Gent. Magaz.* Oct. 1751, and July, 1755, p. 343.

"Scarlet Fever" at St Albans, 1748.

The same disease that Fothergill described for London and villages near was seen at St Albans in the autumn of 1748, and described as "a particular kind of scarlet fever," by Dr Nathaniel Cotton, who kept a madhouse there. Among his friends were the poet Cowper (at one time his patient), and Young, of the 'Night Thoughts.' Cotton himself had the same melancholy cast of mind, and found the same solace in making verses, which have probably served more to keep his memory green than his essay in medicine[1]. He professes to describe "a particular kind of scarlet fever" in his title-page; and in the text he has this remark: "From this diversity of symptoms, I have found some practitioners inclined to think that this disease could not with propriety be called a scarlet fever. But I imagine that such disputes are about words only." It is, indeed, difficult to find any real difference between his particular kind of scarlet fever and the "sore-throat with ulcers" which Fothergill wrote upon a few months before, or, again, between his scarlet fever and that of Withering thirty years after.

The sickness began about the end of September, 1748, in St Albans and some towns adjacent. At first it attacked children only, afterwards also adults. The symptoms given are just those detailed by Fothergill, as well as by Douglass for New England:

> Sickness with purging at the outset, rapid swelling of the tonsils and (or) the parotids and maxillary glands, whitish sloughs on the tonsils, small ulcers up and down the fauces, the eyelids puffed as in measles, swelling of the neck, arms and hands in many; some swelling of the body also, intense red efflorescence, coming on either suddenly or tardily, with thick spots as if dipped in blood. On the face, neck and breast, the rash was even with the surface, elsewhere it was miliary or shagreen. Some were restless or anxious, and delirious, others so drowsy that when awakened to receive a draught or the like, they relapsed at once into stupor. The attack, if not violent, ended on the fourth or fifth day; there were few in whom the fever did not return on one, two or more evenings thereafter, so going off gradually. In one or two, the parotids swelled after the fever was gone, continuing hard

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[1] Nathaniel Cotton, M.D. *Observations on a particular kind of Scarlet Fever that lately prevailed in and about St Albans.* In a Letter to Dr Mead. London, 1749 (12th February). The copy in the British Museum library has a written note signed R. W. (Robert Willan, M.D.): "The only just and correct account; but was not noticed during the author's lifetime, and it has since been consigned to oblivion." In his work *On Cutaneous Diseases* (1808), Willan sarcastically contrasts the means by which Fothergill gained fame while Cotton escaped notice; of the latter he says: "But, as he gave an old appellation to a disease certainly not new, his work attracted little attention, and procured him no emolument."

> for a fortnight and then suppurating. In nearly all, the cuticle peeled off "as in other scarlet fevers." In some the nervous system was much shaken; in particular they dreaded the approach of evening with an unusual kind of horror, and started at the shadows of the candles on the wall. In convalescence some complained of universal soreness. The spots where blisters had been applied continued to discharge in some cases eight or ten days or more.

Besides the reference to swelling of the neck, arms or body among the early symptoms, there is no reference to oedema, while the pallid dropsy of convalescence, which Withering described in 1779, is not mentioned. It is noteworthy that Cotton, who lays the emphasis on the scarlatina, and not on the throat-disease, was of opinion that the copiousness of the eruption was not a measure of the security of the patient, although that was clearly the opinion of Huxham and others, who laid the emphasis on the sore throat.

Epidemics of Sore-throat with Scarlet rash in the period between Fothergill and Withering.

The years 1751–52, and indeed the whole of that decade, saw a good deal of the same diseases, after which little is heard of them until 1778. Huxham's accounts for Plymouth, which are of the first importance, begin with 1751[1]. They are of importance because his memory went back to the anginose fever of 1734, in which the miliary eruptions, with sweats, were critical or relieving to the throat, and because he could not clearly distinguish between them and the sore-throats of 1751–52, although he follows Fothergill in identifying the latter with the Spanish *garrotillo*. The throat affection began in the end of 1751, and became most severe in October, November and December, 1752, in Plymouth and at the Dock and all around, carrying off a great many adults as well as children. It ceased in May, 1753. He describes the sloughing patches in the throat, the excoriated nostrils with acrid dripping discharge, the swelling of the parotids and sometimes of the whole neck, just as other writers had done; and gives the account of laryngeal or tracheal membranes already cited (p. 695). It is perhaps more important to dwell upon his account of the rash. Most commonly the angina came on before the efflorescence, but in many instances the cuticular eruption appeared before the sore-throat.

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[1] John Huxham, M.D., *A Dissertation on the Malignant Ulcerous Sore-Throat.* London, 1757.

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[1] John Huxham, M.D., *A Dissertation on the Malignant Ulcerous Sore-Throat*. London, 1757.

"A very severe angina seized some patients that had no manner of eruption, and yet even in these a very great itching and desquamation of the skin sometimes ensued; but this was chiefly in grown persons, very rarely in children." Commonly there was a rash, general or partial, on the second, third or fourth day.

"Sometimes it was of an crysipelatous kind, sometimes more pustular; the pustules were frequently very eminent, and of a deep fiery-red colour, particularly in the breast and arms, but oftentimes they were very small and might be better felt than seen, and gave a very odd kind of roughness to the skin. The colour of the efflorescence was commonly of a crimson hue, or as if the skin had been smeared over with the juice of raspberries, and this even to the fingers' ends; and the skin appeared inflamed and swollen, as it were; the arms, hands and fingers were often evidently so, and very stiff and somewhat painful. This crimson colour of the skin seemed indeed peculiar to this disease." The eruption seldom failed to give relief; but there were also cases of an universal fiery exanthem which proved fatal. An early and kindly eruption, when succeeded by a very copious desquamation of the cuticle, was one of the most favourable symptoms.

Comparing it with the *febris anginosa* which he had entered in his annals under the year 1734, at a time when the ulcerous or malignant sore-throat was still unheard of, he says that the earlier type differed from the later in being more inflammatory, and less putrid; the sore-throat of 1751–52 might seem to be a disease *sui generis*, but it differed from the anginose fever of 1734 only in the above respect: "In a word, the high inflammatory smallpox differs as much, or more, from the low malignant kind, as the *febris anginosa* from the pestilential ulcerous sore-throat." In the latter he found the remarkable evidences of putridity already cited in connexion with putrid fevers[1]. He gives the case of a boy of twelve whose tongue, fauces and tonsils were as black as ink, he swallowed with difficulty, and continually spat off immense quantities of a black, sanious and very foetid matter for at least eight or ten days; about the seventh day, his fever being abated, he fell into a bloody dysentery, but recovered eventually. In a few the face before death became bloated, sallow, shining and as if greasy, and the whole neck swollen. Even the whole body might be oedematous in some degree, retaining the impression of the finger.

Perhaps it may be said that Huxham had really to do with two diseases; and he does in one place say: "The anginose fever still continued, and we had several of the malignant sore-

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[1] *Supra*, p. 125.

throats in September, many more in October, &c."—as if the two were not the same. But he generalized the "epidemic constitution" of 1751–52, in another way: "In all sorts of fevers there was a surprising disposition to eruptions of some kind or other, to sweats, soreness of the throat and aphthae. The smallpox were more fatal in August, and sometimes attended with a very dangerous ulceration in the throat and difficulty of swallowing. Indeed the malignant ulcerous sore-throat was now also frequent, probably sometimes complicated with the smallpox." Even pleuritic and peripneumonic disorders were attended during this constitution with a sore-throat, aphthae, and some kind of cuticular eruption.

Some facts about the throat-disease at Kidderminster and other places in Worcestershire will complete this part of the somewhat perplexing history. Dr Wall says [illegible] appeared about the beginning of 1748 chiefly in low situations[1]: "It then went generally under the name of scarlet fever, the complaint in the throat not being much attended to, or at least looked upon only as an accidental symptom." His first cases were at Stratford-on-Avon—a young lady who recovered with difficulty, and then two sisters who died, all three having been treated by blood-letting and the cooling regimen. By these cases Wall was convinced that the disease was more putrid than inflammatory, that it was infectious, that the antiphlogistic treatment was a mistake, that bark was the grand remedy, that the throat was the principal seat, and that the scarlet efflorescence was rather an accidental symptom than essential to the disease, some having petechiae and purple spots. He adopts Mead's name of *angina gangraenosa.* The malady had been rife in the city of Worcester, and most of all at Kidderminster, where it was in a manner epidemical. He was told that nine or ten poor persons had died of it there one after another. Having been called to the child of a respectable tradesman, he treated the case with bark and the cordial regimen. He persuaded the Kidderminster surgeons and apothecaries to adopt the same method, which they did with such success that, as he found afterwards in the book of one of them, there were only 7 deaths in 242 cases of the disease, while Dr Cameron did not fail once, and Wall himself had fifty recoveries and only two deaths. It is said, however, on the authority of the parish

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[1] John Wall, M.D. "Bark in the Ulcerated Sore Throat." *Gent. Magaz.* 1751, Nov. p. 497. Dated Worcester, 15 Oct. 1751.

register, that a hundred persons died at Kidderminster of the malignant sore-throat in 1750, "in the months of October and November only[1]." Dr Wall goes on to say that the "Kidderminster sore-throat" had a vast variety of symptoms, the only certain ones being aphthous ulcers and sloughs on the tonsils and parts about the pharynx. "Very few here [which may mean Worcester] have had the scarlet efflorescence on the skin." Dr Johnstone, senior, confirms this in a measure for Kidderminster[2]: "The anginous fever was not always, though often, attended with cutaneous eruptions; and these, for the most part red, were sometimes also of the christalline miliary kind." And in writing again in 1779, when Withering's scarlet fever was dominant in place of Fothergill's sore-throat, Dr Johnstone said: "A scarlet eruption was a much more frequent symptom of this disease than it used to be when I first became acquainted with it nearly thirty years ago." But, as it is known that the rash of true scarlet fever is far less constant in adults than in children, and as many of the attacks referred to by Wall and Johnstone were in adults, the so-called Kidderminster sore-throat may have been a fairly uniform scarlatina. Still, it is clear that all the leading writers, excepting Cotton, of St Albans, distinguished between sore-throat (gangrenous, malignant, or ulcerous) and scarlatina, identifying the former with the old *garrotillo* of Spain and Italy[3]. The distinction may have been really between scarlatina simplex and scarlatina anginosa, as Willan believed; but, whether the disease were malignant scarlatina, or diphtheria, or a mixture of the two (as in Cornwall), or an undifferentiated type with the characters of both, it was certainly new as a whole to British experience in that generation, and, if we except the reference by Morton to certain cases which may have been sporadic, it was a disease hitherto unheard of in England since systematic medical writings began. We may realize the impression which it made, both in the American colonies and in England in the middle third of the 18th century, by recalling the sudden appearance of diphtheria some thirty-five years ago;

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[1] Nash, *History of Worcestershire*, II. 39.

[2] James Johnstone, M.D., *Malignant Epidemic Fever of* 1756. London, 1758.

[3] To those who explicitly distinguish the sore-throat or angina maligna from scarlatina may be added Dr Richard ussell: "In hoc quidem morbi statu mitissimo, si ad quartum vel quintum usq. liem eruptiones in cute superstites sint, paulatim recedant, et desquamationes furfu. eae, perinde ut in febre scarlatina, post se reliquant, ibi crisis integra et perfectissima est." *Œconomia Naturae in Morbis Acutis et Chronicis Glandularum.* Lond. 1755, p. 105 seq.

but, whereas the diphtheria of 1856–58 came upon a generation of practitioners who had seen much of the very worst kinds of scarlatina for twenty years or more, the contemporaries of Huxham, Letherland, Fothergill, Johnstone and Wall in England, or of Douglass, Colden and Bard in America, knew no scarlet fever but scarlatina simplex. The outbreaks of the 18th century throat-distemper in certain families were of the same tragic kind as diphtherial outbreaks in our own time. Instances of whole families swept away have been cited from the New Hampshire epidemic of 1735. Horace Walpole gives the following instance of a noble family in London:

> "There is a horrid scene of distress in the family of Cavendish; the Duke's sister, Lady Bessborough, died this morning of the same fever and sore throat of which she lost four children four years ago. It looks as if it was a plague fixed in the walls of their house; it broke out again among their servants, and carried off two a year and a half after the children. About ten days ago Lord Bessborough was seized with it and escaped with difficulty; then the eldest daughter had it, though slightly: my lady attending them is dead of it in three days. It is the same sore throat which carried off Mr Pelham's two only sons....The physicians, I think, don't know what to make of it[1]."

The medical accounts of the sore-throat of those years are none the easier to interpret in a modern sense owing to the frequent use of the term "miliary" to describe the rash. Douglass had used this term in the title of his Boston essay in 1736. Bisset applies it to a Yorkshire epidemic some twenty years after[2]. The disease began among adults at Whitby in September and October, 1759, and spread over the country between the coast and Guisborough in the spring of 1760, as well as in some places to the westward of the latter; afterwards it became epidemic in all the western parts of Cleveland in August and September of 1760, the summer months having been almost a clear interval. It was remarkable, he says, that some persons in the eastern parts of Cleveland who had escaped it when it was epidemical in the spring, were attacked by it in the autumn after it "had got a good way to the westward of them." This epidemic progression is spoken of as of a single but composite disease,—"the epidemic throat-distemper and miliary fever that appeared in the Duchy of Cleveland in 1760." In adults it was mostly an affection of the throat, few having the miliary eruption, and only one adult

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[1] *Letters of Horace Walpole*, ed. Cunningham, III. 280, letter to Mann, 20 Jan. 1760.

[2] Charles Bisset, *Essay on the Medical Constitution of Great Britain, with obs. on the weather and diseases in* 1758–60. London, 1762.

dying "within the circle of my observations." But in children the fever with miliary rash was predominant, and of it the fatality is put at one death in every thirty cases. There is no discussion as between the names of scarlet fever and miliary fever; but the following on the peeling of the skin is significant: "From the ninth to the thirteenth day the scarf-skin begins to peel off in cases that were attended by a copious rash; and that of the hands and feet sometimes came off almost entire." Soreness of throat often happened in this fever of children; and, to repeat, the sore-throat of adults and the miliary fever of children are described as parts of one and the same epidemic[1]. An account which probably relates to the same disease comes from Rotherham or Sheffield in a letter by Dr Short, the epidemiologist, to Rutty, of Dublin. It was very violent, he says, in July, 1759, and cut off whole families of children. The attack was attended with diarrhoea, swelled tonsils, oedema of the face, an eruption like measles all over the body, and a discharge of sanious humour from the nostrils. "In some there was an efflorescence on the skin like the scarlet fever, and these recovered[2]."

Another complication arises owing to the prevalence, in the same period, of putrid or miliary fevers, which had sometimes an anginous or "throaty" character. This source of perplexity extends from near the beginning to near the end of the 18th century, but it is greatest in the middle period, when the "constitution" was most decidedly "putrid[3]." The relationship was most definitely expressed by Johnstone, of Kidderminster: "This malignant fever (*vide supra*, p. 123) was very often, though not constantly, complicated with, and in general had great analogy with the malignant sore-throat which at this time prevailed in many parts of England." An Oxford practitioner, in 1766, actually wrote a dissertation to distinguish the "putrid sore-throat" which attended the "putrid" continued fever of the

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[1] Hecker (u. s.) identified Bisset's epidemic disease in Cleveland with Douglass's in New England. Merely because they used the term "miliary," he erects their epidemics into an imaginary class of *angina miliaris* which was not scarlatina.

[2] Short to Rutty, Rotherham, 26 March, 1760, in Rutty's *Chronol. Hist. of Weather, &c. and Diseases in Dublin.* London, 1770, p. 117.

[3] Sir David Hamilton, *Tractatus Duplex, &c.* London, 1710 (Engl. transl. 1737, p. 84), says that, in 1704, several in the "miliary fever" had "a pain in the jaws resembling that of the squinsy," which killed many suddenly. At the other end of the century, Willan (*Cutaneous Diseases*, 1808, p. 333), said of fever in 1786: "The title 'angina maligna' would have applied with equal, if not with more propriety, to the sore-throat connected with a different species of contagion, namely, that of the typhus or malignant fever originating in the habitations of the poor where no attention is paid to cleanliness or ventilation."

time, from the "gangrenous sore-throat" of Fothergill, Huxham and others: in the former, the aphthae and sloughs of the tonsils and uvula, as well as of the mouth, were only symptomatic of the putrid fever, and late in showing themselves; in the latter, the throat affection was the primary and dominant one, present from the beginning of the illness[1].

The last complication of the highly complex circumstances in which scarlatina first became a great disease in England is with "putrid" or malignant measles. In the same years as the epidemic described above for Yorkshire, namely, 1759 and 1760, there occurred an "anomalous malignant measles," which for some months had made a melancholy carnage amongst children in the west of England. The symptoms were difficult breathing, an amazingly rapid pulse, white or brown tongue, and "some red eruptions which ran in irregular groups and splatches on the surface of the skin." The attack was apt to be attended by colliquative diarrhoea. A fatal issue was indicated by a sunken and very quick pulse, the abatement of the dyspnoea, and the eruption coming and going. Some rapid cases in infants ended in convulsions on the third day. Children from one to six years were attacked most[2]. Perhaps the only reason for not including this among epidemics of measles is the author's remark: "I look upon the poison of the disease to be a good deal akin to that of the ulcerated sore-throat so very rife and fatal some years since," although he does not allege throat-complications in the malady which he describes.

Three years later, in 1763, there was an epidemic at the Foundling Hospital, London, which Watson, the physician to the charity, described in a special essay as one of "putrid measles." Willan, writing in 1808, challenged the diagnosis on the ground both of the symptoms as given by Watson, and of the names given to the malady in the Infirmary Book at the time. The first entry in the apothecary's book is on 23 April, 1763, a case of "fever with a rash," the next on 30 April, a case of "scarlet fever," then on 7 May, ten cases of "eruptive fever," and, for the rest of May and all June, very long lists of "eruptive fever," the name of measles not occurring at all in that outbreak,

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[1] Francis Penrose. *A Dissertation on the Inflammatory, Gangrenous and Putrid Sore-Throat. Also on the Putrid Fever.* Oxford, 1766.

[2] *Some Thoughts on the Anomalous Malignant Measles lately peculiarly prevalent in the Western Parts of England.* London, 1760. And to be sold at Bath and Exeter.

while the names of "morbillous fever" and "fever" are given to a smaller but still considerable outbreak in November of the same year. Among the symptoms, Watson mentions that the fauces were of a deep red colour, that the rash came out on the second day, and that there was no cough. The most remarkable character of the epidemic as a whole was a tendency to sloughing in various parts:

> "Of those who died some sank under laborious respiration: more from dysenteric purging, the disease having attacked the bowels; and of these one died of mortification in the rectum. Besides this, six others died sphacelated in some one or more parts of the body. The girls who died most usually became mortified in the pudendum. Two had ulcers in their mouth and cheek, which last was so covered by them that the cheek, from the ulcers within, sphacelated externally before they died. Of these one had the gums and jawbone corroded to so great a degree that most of the teeth on one side came out before she died. The lips and mouth of many who recovered were ulcerated, and continued so for a long time." The anatomical examination of those who died showed the bronchitic affection, in one case pleurisy, and in some a gangrenous condition of the lungs. One died of emaciation six weeks after the attack. Eleven others succumbed shortly after to smallpox, out of eighteen who caught the latter during recovery from the preceding epidemic disease[1].

Long after, in 1808, when the diagnosis between measles and scarlatina was fixed, Dr James Clarke saw at Nottingham in several cases of measles "a great tendency to gangrene," the sites of blisters having mortified in two (as in scarlet fever) and two having gangrene of the cheek and mortification of the upper jaw[2]. Huxham, he says, saw such cases, Willan never; and that was one of the reasons why Willan claimed the Foundling cases as scarlatina. The diagnosis is important; for, in the same year, 1763, the bills of mortality record 610 deaths from measles in London, and Watson expressly includes the 19 deaths in the Foundling Hospital (in 180 attacks) as part of the general epidemic in London.

The confusion between measles and scarlatina is farther shown by the entries in the Infirmary Book of the Foundling Hospital from the beginning to the end of an extensive epidemic in 1770: On 31 March, 23 children are in the infirmary with "measles," and on 7 April, 37 children still with "measles"; on 12 May the long list is headed "measles and ulcerated sore-

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[1] William Watson, M.D. "An Account of the Putrid Measles as they were observed at London in the years 1763 and 1768." *Med. Obs. and Inquiries*, IV. (1771), p. 132.

[2] James Clarke, M.D. "Medical Report for Nottingham from March, 1807, to March, 1808." *Edin. Med. Surg. Journ.* IV. 425.

throat," on 19 May, "putrid fever," and on 26 May, "fever and ulcerated sore-throat[1]."

Whether or not we agree with Willan in taking the Foundling epidemic of 1763 (and perhaps with it the general epidemic in London) for one of scarlatina, it can hardly be doubted that the Foundling epidemic of 1770 was the latter disease, the names of "measles with ulcerated sore-throat," "putrid fever," and "fever and ulcerated sore-throat" clearly indicating scarlatina anginosa. Grant also records the prevalence of epidemic sore-throat in London in 1770[2], and Dr. William Fordyce, writing in 1773, dealt with the "ulcerated and malignant sore-throat" as a question of the day[3].

It was not until forty years ago, he says, that they had become acquainted in England with ulcerated and malignant sore-throat, while "both kinds" are now very common. His aim is to separate the ulcerated from the malignant, and he instances an outbreak in a gentleman's house at Islington, where the worst symptoms of the malignant occurred in the children, while only the ulcerous prevailed among the servant maids. In 1769 it was reported to be seldom fatal in London and Westminster, and in the villages around; but within these last twelve months (1773) it had appeared of a bad type in high situations such as Harrow, in the months of June and July. In a later note, he adds that "it still continues to make a havock so considerable as to keep up the alarm about it both in the metropolis and all over England," his own last experience of it having been two fatal cases in a noble family a few miles to the west of London. Fordyce identified this disease with Fothergill's sore-throat, and described the eruption as "the general erysipelatous colour that comes about the second day on the face, neck, breast and hands to the finger ends, which last are tinged in so remarkable a manner that the seeing of them only is sufficiently pathognomonic of the malady [this is a repetition of Huxham and Fothergill]; and finally a great number of small pimples, of a colour more intense than that which surrounds them, appearing in the arms and other parts of the body." He gives the following as a case of the malignant sore-throat in a young gentleman five or six years

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[1] These changes of the name from week to week represent probably the independent judgment of the apothecary more than the modified opinions of Watson the physician. The views which the latter expressed in his paper of 1771, are clearly reechoed in the following anonymous paragraph in the *Gent. Magaz.* XLII. (1772), Nov. p. 541: "The measles have lately been very rife and fatal in this metropolis. They are of a very different kind from those described by the great Doctor Sydenham, being of a malignant putrid nature, such as visited London in 1763 and 1768, where bleeding seemed of so little service, but small does of emetic tartar, cordial medicines and blisters, were very efficacious. The above disorder was epidemic at Plymouth and parts adjacent in the years 1745 and 1750, and so long since as the year 1762 [1672] was described by Dr Morton, who says it raged so severely during the autumn of that year that it appeared like a gentle kind of plague, sparing neither sex nor age, and that 300 died weekly of it."

[2] W. Grant, M.D., *Account of a Fever and Sore Throat in London, September, 1776.* London, 1777.

[3] W. Fordyce, M.D. *A new Inquiry into the Causes, Symptoms and Cure of Putrid and Inflammatory Fevers; with an Appendix on the Hectic Fever, and on the Ulcerated and Malignant Sore Throat.* London, 1773. The appendix on Sore-throat is pp. 209–222.

> old: "Every part of the body that bore its own weight was gangrened, as well as the orifices where he had been blooded twice before I saw him (which was three days after the seizure); the parotid glands were very much swelled, the whole body was more or less oedematous, and the skin throughout of an erysipelatous purple; he died the third day after I saw him."

Although Fordyce, and probably most others, still adhered to Fothergill's view of the sore-throat with ulcers as a disease apart, yet there appear to have been at this date some who followed the line taken with regard to it by Dr Cotton in 1749. Sometime about the end of 1771 or beginning of 1772, a physician at Ipswich sent to a London physician, who sent it to the *Gentleman's Magazine*, an account of a "Successful Method of treating the Ulcerated Sore Throat and Scarlet Fever," by tartar emetic, calomel &c.[1] He begins: "The ulcerated sore-throat and scarlet fever has been very rife in this place and the neighbourhood for some months past, and has been in a considerable number of instances fatal. It has in every respect answered the description given of it by Dr Fothergill"—so much so that he does not give the symptoms, but only the treatment, which, in his own hands, had been singularly successful: "I have had considerably more than one hundred patients, and have not buried one," his cases, between the writing and printing of the paper (3 June) having "increased to near three hundred with the same success." This must have been an interval of mild scarlatina, during which the prevalence of the malady, however extensive, had attracted little notice. The outburst in 1777–78, from which the diagnosis and naming of scarlatina anginosa properly date, was obviously an interruption of a quiet time of the disease.

Scarlatina anginosa in its modern form, 1777–78.

Dr Levison[2], who was physician to a London charity called the General Medical Asylum located at No. 4, Tottenham Court-road (afterwards in Welbeck Street), observed the outbreak, on 15 July, 1777, of a malignant sore-throat, "nearly such as described by Dr Fothergill and Dr Huxham (only without the efflorescence and attended with costiveness)," among children from three to seven years, by which many were cut off in the space of six to eight days, some by suffocation and others by

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[1] *Gent. Magaz.* XLII. (1772), June, p. 258.

[2] G. Levison, M.D., *An Account of the Epidemical Sore-Throat.* 2nd ed. corrected. London, 1778 (1st ed. 1778).

vomiting of blood. It became more general in August, and in some was very malignant, being joined with an erysipelatous inflammation and a diarrhoea. It raged with great fury in Kentish Town, and at Enfield Chase it swept away many in twenty-four hours. But on the high ground about London, as at Hampstead and Highgate, it was of a benign type. It was worse in the villages round than in the capital itself.

In the milder form, there was only a superficial whiteness of the uvula, tonsils and velum; in the more severe, the same parts were beset with thick ulcerations, running very deep in the fauces. Both in the milder and in the more severe cases the neck became swollen on the second or third day. The commencement was usually with shivering and nausea, followed by heat, and an efflorescence over the breast, the limbs, and often the whole body, of a crimson red. "Some were spread over with a kind of little millets, similar to that in the miliary fevers, and which scaled off the skin the sixth or seventh day; in which cases the ulcerations were very slight, as also all other symptoms of malignancy." The mouth was apt to be full of sloughs, the teeth covered with black crusts. The urine was scanty, high-coloured, with a thin suspended cloud. Some bled from the nose. The nostrils were apt to be stuffed with greenish sanies which dropped out continually. The efflorescence and sore-throat were often met with separately. Most had cough throughout, great dejection of spirits, and oppressed breathing. The disease had no regular progress and no crisis; the whole of the symptoms would often cease suddenly about the eighth or ninth day. In one case there was recovery after three weeks' illness. Several cases had suppuration of the glands of the neck. In one fatal case, a tumour behind the right tonsil was found to contain three ounces of fœtid pus.

Oedema was frequent after recovery—the lips, nose and face bloated, sallow, shining and greasy; the belly also might be swollen. This, says Levison, was a peculiar kind of dropsy; and as he adds that it had not been remarked by Huxham he intends to distinguish it from the bloated greasy appearance which Huxham did remark. Some died of it a month after the fever; many recovered from it by the aid of calomel, rhubarb and diuretics—the treatment for the scarlatinal dropsy—and full doses of bark. In the acute disease blisters were sometimes tried, in compliance with custom; but they did no good, and occasioned a great discharge of thick matter. Bleeding and antiphlogistics were seldom called for. This outbreak, which began in July 1777, abated in November. Next year it came back about the middle of March, but in a benign form, and unattended with either the efflorescence or the diarrhoea, and so continued until the date of writing, the 11th May, 1778. Levison distinguishes two or three types—a malignant sore-throat at the outset early in summer, 1777, to which in autumn two other epidemics were joined, namely, on the one hand, scarlet fever

(or miliary fever), and on the other hand, a purging like autumnal dysentery.

The second season of the epidemic in London[1], the spring and summer of 1778, saw the outbreak of malignant sore-throat, with rash, in the Midlands. It appeared in Birmingham about the middle of May, and in June it was frequent in many of the towns and villages in the neighbourhood. It continued to the end of October, and revived a little during mild weather after the middle of November. It seems to have reached Worcestershire in the autumn, cases having been seen first at Stourbridge and afterwards at Kidderminster and Cleobury. According to Johnstone, the younger, it broke out first in schools, and spread very rapidly among children, attacking adults sometimes. The summer of 1778 was remarkable for heat, which is described as West Indian in its intensity.

The account of this epidemic which has attracted most attention (and deservedly) is that of Withering, of Birmingham, who had written his thesis at Edinburgh twelve years before (1766) on *angina gangraenosa.* He calls it definitely by the name of "scarlet fever and sore-throat, or *scarlatina anginosa*," explaining that it was "preceded by some cases of the true ulcerated sore-throat," by which he meant the disease described by Fothergill in 1748. The elder Johnstone, then of Worcester, who had described the Kidderminster sore-throat of 1750--51, declared that the scarlet eruption was a more common symptom of this 1778 disease than it used to be when he first became acquainted with it near thirty years before; and dealing with the same epidemic as Withering, he makes out three varieties:—namely, first the scarlatina simplex of Sydenham, with no sore-throat, second, the scarlatina anginosa, and third, the ulcerated sore-throat[2]. His son, who also wrote upon the epidemic of 1778 as he saw it at Worcester, having written his Edinburgh thesis upon malignant sore-throat several years before, says: "The disease which now prevails is the ulcerous malignant sore-throat, combined with the scarlet fever of Sydenham[3]." Saunders, a retired East Indian surgeon,

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[1] It might have been the third, as Grant (u.s.) says there was fever with sore-throat in London in September, 1776.

[2] "Angina and Scarlet Fever of 1778." *Mem. Med. Soc.* III. 355.

[3] James Johnstone, junr. M.D., *A Treatise on the Malignant Angina or Putrid and Ulcerous Sore-Throat, &c.* Worcester, 1779.

described the corresponding epidemic in the north of Scotland as one of sore-throat and fever[1].

Withering's account of the symptoms differs little from that given by Levison the year before, and is chiefly noteworthy for confirming that writer as to the occurrence of scanty urine and oedema[2]:

> The rash came out on the third day, continued scarlet, the colour of a boiled lobster, for two or three days, then turned to brown colour, and desquamated in small branny scales. He had been told of three instances in which the desquamation was so complete that even the nails separated from the fingers. In the colder weather of October the scarlet colour was less frequent and less permanent. Many had no appearance of it at all; while others, especially adults, had on tender parts of the skin a very few minute red pimples crowned with white pellucid heads. The worst cases fell into delirium at the outset, had the scarlet rash on the first or second day, and might die as early as the second day; if they survived, the rash turned to brown, and they would lie prostrate for several days, nothing seeming to afford them any relief. "At length a clear amber-coloured matter discharges in great quantities from the nostrils, or the ears, or both, and continues so to discharge for many days. Sometimes this discharge has more the appearance of pus mixed with mucus. Under these circumstances, when the patients do recover, it is very slowly; but they generally linger for a month or six weeks from the first attack, and die at length of extreme debility." These discharges, compared by a writer a generation before to glandered secretions, are not to be confused, says Withering, with the matter from abscesses on both sides of the neck, under the ears, which "heal in a few days without much trouble." The submaxillary glands were generally enlarged. Adults usually had a ferretty look of the eyes, and sometimes small circular livid spots about the breast, knees and elbows. Some had a succession of boils. One man had "lock-jaw." Most patients had the fauces, particularly the tonsils, covered with sloughs, which separated and left the parts raw, as if divested of their outer membrane. The most troublesome symptom was exulcerations at the sides and towards the root of the tongue; these were painful and made it impossible to swallow solid food. Some threw out several white ash-coloured sloughs, though no such sloughs were visible upon inspecting the throat.

With reference to the diagnosis between scarlatina anginosa and angina gangraenosa (of Fothergill) Withering says: "They are both epidemic, they are both contagious; the mode of seizure, the first appearances in the throat, are nearly the same in both; a red efflorescence upon the skin, a great tendency to delirium and a frequent small unsteady pulse are likewise common to both. With features so strikingly alike, and these, too, of the most obvious kind, is it to be wondered that many practitioners considered them the same disease?" And again: "But perhaps

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[1] Robert Saunders, *Observations on the Sore-Throat and Fever in the North of Scotland in* 1777. London, 1778.

[2] William Withering, M.D., *Account of the Scarlet Fever and Sore-Throat, particularly as it appeared at Birmingham in* 1778. London, 1779; preface dated 1st January.

he will never be able precisely to draw the line where the light begins and where the penumbra ends[1]."

The extent of the epidemic of scarlatinal sore-throat, of which we have particulars from Middlesex, Warwickshire and Worcestershire in 1778, cannot be ascertained. It is heard of, as we saw, in the north of Scotland in 1777. According to Barker, of Coleshill, the scarlet fever which "in a manner raged in the neighbouring town of Birmingham," occurred in only a few cases in his own parish, and these mild[2]. It appears to have been in Carlisle the year after, 1779, under which date Heysham says that "two epidemics swept off a great number of children—smallpox and a species of scarlet fever[3]." Nothing more is heard of it in Carlisle for the next eight years, during which Heysham kept an account of the diseases. The epidemic of 1778–9 fell also upon Newcastle:

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[1] Withering was perhaps too desirous to be thought the first in England to have described scarlatina anginosa. "The scarlet fever in its simple state," he says, "is not a very uncommon disease in England, but its combination with a sore-throat, as described above, the violence of its attack, and the train of fatal symptoms that follow, are circumstances hitherto unnoticed by English writers." It is probable from this that he had not seen Levison's essay, with preface dated 11 May, 1778, his own being dated 1 January, 1779; but Cotton's essay of 1749 actually bore the name of scarlet fever on its title-page, and described the throat-affection, glandular swellings, and the like quite correctly.

The name of the elder Heberden is frequently brought into the history of the identification of scarlatina, with a reference to his *Commentaries on Diseases*, which were not published until 1802, some time after his death at a very advanced age. The following are among his remarks: "In the fever which has just been described there is always some degree of redness in the skin, and the throat is not without an uneasy sensation. Where it happens that the throat is full of little ulcers attended with considerable pain, there the disease, though the skin be ever so red, is not denominated from the colour, but from the soreness of the throat, and obtains the name of *malignant sore-throat*; and many suppose that the two disorders differ in nature as well as in name," p. 23. "The enfeebled and disordered state of all the functions of the body evidently points out such a malignity of the fever as cannot be owing to the affection of the uvula or tonsils, which in other distempers we often see ulcerated and eaten away, without any danger of the patient's life. These sores, therefore, like pestilential buboes, point out the nature of the disorder; but the danger arises, not from them, but from the fever," p. 25.

In 1790 an elaborate attempt was made by William Lee Perkins, M.D. (dating from Hampton Court, 1 March) to distinguish between cynanche maligna and scarlatina anginosa, in *An Essay for a Nosological and Comparative View of the Cynanche Maligna or Putrid Sore-Throat, and the Scarlatina Anginosa*. London, 1790. He proceeds by the nosological method of Sauvages and Cullen, erecting genera, species and varieties. The result is not clear after all; for on p. 43 (note) we read that *scarlatina* is frequently accompanied with inflammatory and ulcerous appearances in the fauces or throat, and that *angina maligna* or ulcerated sore-throat is often attended with red efflorescence on the skin; this had led to their being regarded as one and the same, and treated by the same method of cure.

[2] J. Barker, *A Treatise on the Putrid Constitution of* 1777 *and the preceding years, and the Pestilential one of* 1778. London, 1779 (of inferior value beside Withering's).

[3] Heysham, in Hutchinson's *Hist. of Cumberland*, u. s.

From the month of June, 1778, until the 1st September, 1779, there were treated 146 cases of "ulcerated sore-throat," of which 18 were fatal. The epidemic was at its height in September and October. The ages were: under ten years, 98, ten to twenty, 25, twenty to thirty, 18, above thirty, 5. Dropsy followed in 23; 75 were mild scarlatina and sore-throat, 33 were angina maligna. During the ten years following, until 1789, only 57 more cases were treated from the Newcastle Dispensary, of which 8 were fatal[1].

History of Scarlatina after the Epidemic of 1778.

In London, according to Dr James Sims, scarlatina with sore-throat occasioned a great mortality in the latter half of 1786. The bills of mortality assign only 19 deaths to sore-throat, while they give 793 for the year to measles. But Sims says that "measles were not present in London during the whole year; at least I saw none, and I saw about two thousand cases in private and at the General Dispensary."

The deaths from scarlet fever, he thinks, had been given under measles and also under "fevers," which were a large total for the year. The epidemic was very virulent, going through families; many lost two children, some a larger number; many adults fell victims to it who were supposed to die of common fever.

Sims' first case was of a youth at Camberwell, in March, with scarlet rash and sloughs of the throat. He saw no more cases for several weeks, and then, on 1 May, he was called to a case of sore-throat in a school at Hampstead; the illness was slight, and there was no efflorescence; but in June there occurred in the same school an explosion of scarlatina, twenty of the girls being seized within a short time. It was in other suburban villages in the summer, but did not enter London until August, after which Sims saw three hundred cases of it; of some two hundred treated by him in a certain way, only two died. The symptoms of the epidemic were the usual ones of scarlet fever with ulcerated or sloughing throat. In November and December, swelling attacked the face and extremities, which were painful but not oedematous. The parotids were swollen. Several had the angina without the rash; others the rash without the angina[2].

The same epidemic in London was [illegible] of the early medical experiences of Dr Robert Willan, who gave some account of it in the volume 'On Cutaneous Diseases' which he published in

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[1] John Clark, M.D., *Obs. on Fevers, and on the Scarlet Fever with Ulcerated Sore-Throat at Newcastle in* 1778. Lond. 1780; *Account of the Newcastle Dispensary from its commencement in* 1777 *to Michaelmas*, 1789. Newcastle, 1789 (also by Clark).

[2] James Sims, M.D. "Scarlatina Anginosa as it appeared in London in 1786." *Mem. Med. Soc. Lond.* I. 388. Willan, however, says that measles was the epidemic in the winter and spring of 1785–86; while the epidemic at the Foundling Hospital was "measles" in March and April, 1786, "fever" in June and July, and "scarlet fever" in 1787.

1808, shortly before his death[1]. It began in the autumn of 1785, was superseded by measles for a time, and revived again in 1786, to last into 1787. It was most malignant in the narrow courts, alleys and close crowded streets of London, but existed also in the villages near. While admitting the existence of measles in the winter of 1785–86, he confirms Sims in saying that it was not measles (as in the Bills) but scarlatina that caused the high mortality in 1786: "The cases of scarlatina during the year 1786 exceeded in number the sum of all other febrile diseases within the same period." The deaths were mostly between the seventh and eighteenth day of the fever. The following is his classification of over two hundred cases seen by himself:

1786

	Scarlatina simplex	Scarlatina anginosa	Scarlatina maligna	Sore-throat without eruption
April	—	3	—	—
May	6	10	2	—
June	4	12	1	4
July	2	11	1	3
August	1	17	4	4
Sept.	2	29	9	12
Oct.	3	24	5	7
Nov.	0	38	12	10
Dec.	0	8	5	2
	18	152	39	42

The infirmary book of the Foundling Hospital has long lists of patients sick of "scarlet fever with sore-throat" in August and September, 1787, as many as 76 being under treatment in one week, the next week 39 sick of scarlet fever, besides 45 recovering from it. This is the first unambiguous entry of an epidemic of scarlet fever in the Foundling Hospital records[2]. Under the same year, 1787, Barker, of Coleshill, records "scarlet fever, smallpox, and chincough" in a neighbouring city, as well as pestilential sore-throats "epidemical everywhere in the terrible foul weather of winter." His next entry of "scarlet fever and sore-throat" is under the year 1791[3].

An account by Dr Denman, of London, dated 28 November, 1790, of "a disease lately observed in infants," but otherwise unnamed, appears to relate to diphtheria. Eight cases in young infants were seen, one per month from April to October, of which six proved fatal. The signs were "thrush in the nose," fulness of the throat and neck, the tonsils red, swelled and covered by ash-coloured sloughs or extensive ulcerations. The skin sloughed at places where blisters were applied. Nothing is said of a scarlet rash[4].

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[1] *On Cutaneous Diseases.* Vol. I. London, 1808, pp. 262, 277, 345.

[2] I have not succeeded in finding the apothecary's book for the years 1776–82, within which the great London epidemic of 1777–78 fell; but Willan, who may have had the complete set of books before him, says (*op. cit.* 1808, p. 245) "the denomination 'scarlet fever and sore-throat' first occurs in the weekly report, 1st September, 1787." I am indebted to the courtesy of Mr Swift, M.R.C.S. for a sight of the books.

[3] J. Barker, *Epidemicks, or General Observations on the Air and Diseases from the year* 1740 *to* 1777 *inclusive, and particular ones from that time to the beginning of* 1795. Birmingham (no date).

[4] *Lond. Med. Journ.* XI, 374.

Scarlatina (1788) and Diphtheria (1793–94) described by the same observer.

One good observer at the end of the 18th century, Rumsey, a surgeon at Chesham, in Bucks, has left full accounts of two epidemics in his district, one in 1788, which he calls "epidemic sore-throat[1]" and the other in 1793–94, which he calls "the croup[2]." The one corresponds to scarlet fever, the other to diphtheria. The author does not think it necessary to enlarge on the distinction between the "epidemic sore-throat" and "the croup" as it was so obvious; yet the former was "Fothergill's sore-throat," which some English writers of the present time assume to have been diphtheria; while the disease which Rumsey calls "the croup" corresponds with laryngeal and tracheal diphtheria, not unmixed with diphtheritis of the tonsils, uvula and velum. There is hardly anything in the history of scarlatina and diphtheria more instructive than the juxtaposition of those two excellent descriptions by Rumsey, who grudged the name of scarlatina to the former epidemic because the rash was not invariable, and called the latter by the name of croup although it was not confined to the larynx and trachea, and was epidemic in the summer months.

The epidemic of "sore-throat" in 1788 began in April and lasted until November, attacking those of every age except the very old, but especially children, and mostly women among adults.

The throat was slightly sore for twelve or twenty-four hours; it then became fiery red, the uvula and tonsils being much swelled. About the second or third day there were whitish or yellowish sloughs on the tonsils and uvula, which in many cases left deep, ragged ulcers. It was many days before the sloughs were all exfoliated. Some spat up an astonishing quantity of mucus; in young children there was apt to be a discharge of mucus from the nostrils, and in a few cases from the eyes. The parotid and submaxillary glands were often enlarged, sometimes suppurating or sloughing. A white crust separated from the tongue on the third or fourth day, leaving it raw and red. In some cases there was sickness with vomiting, in some diarrhoea. In many cases there was a scarlet eruption over the whole body, usually on the second or third day. The fatal cases had all a very red eruption, and the skin burning to the touch. In some the eruption was so rough as to be

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[1] H. Rumsey, "Epidemic Sore-Throat at Chesham in 1788." *Lond. Med. Journal*, X. 7, dated 14 Dec. 1788.

[2] H. Rumsey, "An Account of the Croup as it appeared in the Town and Neighbourhood of Chesham, in Buckinghamshire, in the years 1793 and 1794." *Trans. of a Soc. for Improving Med. and Chirurg. Knowledge*, II. (1800), 25. Read 1 July, 1794.

plainly felt. In a few cases, after the efflorescence broke out, a number of little pustules made their appearance about the breast, arms, &c., of about the size of millet seeds, which died away in twenty-four or thirty-six hours. This was not common; but in one family the mother and three of the four ailing children had pustules. One young man had large white vesicles on the sixth day; another young man, in November, had vesicles on the arms, thighs and legs as large as a half-crown piece, filled with yellow serous fluid, or gelatinous substance, with a good deal of erysipelas round them. The red efflorescence was always followed by peeling. Many had the throat-disease without rash, but none had the efflorescence without the sore-throat.

Rumsey decides against two distinct types of disease; it was the same contagion acting on different constitutions; yet he could not help thinking that scarlatina anginosa was an improper term for it, inasmuch as the rash was not constant. It was a less putrid disease than that described by Fordyce in 1773 (*supra*, p. 707), and carried off but few considering the great numbers who were affected by it. Two of the fatalities in children were from the anasarca of the whole body, with scanty urine, which came on a week or two after. He bled only once, applied leeches to the temples in several, and saw many recoveries with no treatment but topical applications.

The epidemic five or six years after in the same town in a valley of Buckinghamshire and on the hills for some six miles round was something unusual. Rumsey had about forty cases of "the croup" from March, 1793, until January, 1794; whereas his father, who had practised there above forty years, could not recall more than eight or ten cases of "croup" in all his experience. The cases were all in children from one to fourteen years; there were sometimes three attacked in one family; most of the fatal cases occurred in summer; the epidemic was distributed impartially in the valley where Chesham stands and upon the hills enclosing it. Rumsey gives full details of seventeen cases, eight that died and nine that recovered, with post-mortem notes for some.

His first case was in March, 1793; then came a succession of cases about June and July, of which four that proved fatal were in children just recovered from measles. All those earlier cases had the disease coming on insidiously, then the peculiar cough and tone of voice, if any voice remained, paroxysms of choking, expectoration of shreds of membrane, giving relief to the distress, and the trachea found after death lined with a coagulated matter[1]. Among

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[1] "Several children brought up portions of a film, or membrane of a whitish colour, resembling the coagulated matter which was found in the trachea of those children whose bodies were opened. This was thrown off by violent coughing or retching; and the efforts made to dislodge it were often so distressing that the child appeared almost in a state of strangulation."

these summer cases were three children in one family, of whom two died, both being just out of the measles. The later series of cases in the winter of 1793–94 were less often fatal; the epidemic constitution, he says, became less severe towards the end; he also used mercurials freely on the later cases; but it is farther noteworthy that "most of the cases which occurred in November and afterwards, were attended with inflammation and swelling of the tonsils, uvula and velum pendulum palati, and frequently large films of a whitish substance were found on the tonsils"—so that the disease was in its extension more than cynanche trachealis, or croup, even if it had not been also an epidemic infection.

In only one case, the eighth recorded, does he seem to have hesitated between "the croup" and sore-throat: "ulcerated sore-throats being at this time [6 Sept. 1793] somewhat prevalent, induced me to inspect the fauces, and I observed a swelling and no inconsiderable ulcer on the left tonsil." It was in the autumn and winter that these throat complications of "the croup" mostly appeared; and it was because he found "so much disease about the tonsils" in the tracheal and laryngeal cases that he forebore to bleed, and used mercurials. Also in the same season when "the croup" was joined to disease of the tonsils, uvula and velum, there was a certain epidemic constitution prevalent: "In the autumn, likewise, and winter, many children suffered by erysipelatous inflammation behind the ears, in the groins, on the labia of girls, or wherever the skin folded, attended with a very acrid discharge"—precisely the complication of the "throat-distemper" of America described by Douglass and Colden as well as by Bard, also of the Irish throat-epidemic in 1743 mentioned by Rutty, of the morbus strangulatorius in Cornwall described by Starr, and of the sore-throat described by Fothergill. In systematic nosology, do the corrosive pustules behind the ears, in the groins, labia, &c., belong to scarlatina or to diphtheria?

It is perhaps the same juxtaposition, or intermixture of scarlatina anginosa and diphtheria, that we find in the north of Scotland about the same time of the 18th century. Various parish ministers who contributed to the first edition of the *Statistical Account* make mention of "the putrid sore-throat" about 1790 and 1791, without any reference to fever or scarlet rash. The following relates to three localities in Aberdeenshire:

New Deer: "In the autumn of 1791, a putrid kind of sore-throat, which first made its appearance about the coast side, found its way into this parish. Since that, it has continued to rage in different places with great virulence and little intermission, and is peculiarly fatal to the young and people of

a full constitution[1]." Crimond, a coast parish: "The putrid sore-throat raged with great violence two or three years ago [1790 or 1791] in most parishes in the neighbourhood, and carried off great numbers: but though a few were seized with it in Crimond, none died of that disorder[2]." Fyvie, an upland parish:—"There has been no prevalent distemper for some time except the putrid sore-throat, which raged about two years ago [probably 1791] and proved fatal to several people. It has appeared this winter, but is not so violent as formerly[3]."

From Aberdeen the epidemic is reported in a letter by one of the physicians, in May, 1790, in such terms as not to imply that it was scarlatina: "The malignant sore-throat has been most prevalent and very fatal, no period of life being exempted." In children from six months to three years there was observed a livid appearance behind the ears which, in seven or eight cases, spread over the external ear, causing the latter on one or both sides to drop off by sloughing before death[4].

The scarlet fever, with sore-throat, which reappeared in London about 1786–87 (and at Chesham in 1788) is said to have been somewhat steady until 1794. Willan, who began his exact records in 1796, says retrospectively that the scarlet fever with an ulcerated sore-throat had been prevalent every autumn from the year 1785 to 1794, "and proved extremely fatal[5]." Lettsom gave a particular account of it in the spring of 1793[6]; it was seen first in the higher villages about London, gradually descended into lower situations, and visited the metropolis pretty generally about the end of February. "It has been remarked for many years that this disease appears in the vicinity of London before it visits the metropolis," beginning often among the numerous boarding-schools in the suburbs, to be carried thence by the dispersion of pupils to their homes. In some villages private families suffered greatly; in a few Lettsom heard of half the children dying, as well as of deaths among the domestics and other adults. The same epidemic of 1793 also called forth one of the numerous essays of Dr Rowley, who had written on the "malignant ulcerated sore-throat" in 1788[7].

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[1] Sinclair's *Statist. Account of Scotland*, IX. 190.

[2] *Ibid.* II. 412.

[3] *Ibid.* IX. 461.

[4] Livingston to Lettsom, Aberdeen, 13 May, 1790, in *Memoirs of Dr Lettsom*, III.

[5] R. Willan, M.D., *Reports on the Diseases in London*, 1796–1800. Lond. 1801, p. 2.

[6] "Cursory Remarks on the Appearance of the Angina Scarlatina in the Spring of 1793." *Mem. Med. Soc. Lond.* IV. (1795), p. 280.

[7] W. Rowley, M.D., *An Essay on the Malignant ulcerated Sore-Throat, containing reflections on its causes and fatal effects in* 1787, *etc.*, London, 1788; *The Causes of the Great Numbers of Deaths...in Putrid Scarlet Fevers and Ulcerated Sore-Throats explained, etc.*, London, 1793. Based on the practice of the St Marylebone Infirmary.

Scarlatinal Epidemics, 1796–1805.

The history of scarlatina in London, as of most epidemic maladies, is enriched for a few years by Willan's monthly or quarterly accounts of the cases treated at the Carey Street Dispensary. From the beginning of 1796 to the end of 1800, scarlet fever is hardly ever wanting, and is occasionally the principal epidemic. It is only now and then, however, that a death from it appears in the Parish Clerks' bills of mortality. Willan remarks that they gave only one death from that cause between the 8th and 29th November, 1796, "a period during which there occurred many fatal cases of that disease." The bills have only three deaths from it in the quarter 27 Sept.–27 Dec. 1796. The Parish Clerks did not adopt scarlet fever fully into their classification until 1830; long after it had become an important factor in the mortality, they placed the deaths from it under "fevers" or under "measles." According to Willan's experience, it must have been as common as measles from 1796 to 1801. It was, he says, always most virulent and dangerous in the month of October and November, but generally ceased on the first appearance of frost. He records a spring epidemic as an exceptional thing in 1797: "Since the beginning of May, the scarlatina anginosa has become more frequent than any other contagious disease, both in town and in many parts of the country; the disease has generally occurred in its malignant and fatal form, which, at this season of the year, is very unusual." The bills give only one death from 18th April to 18th May. Willan says that it was rife again in the autumn of 1797 and of 1798. Dr James Sims, who had described the scarlatina of London in 1786, found the epidemic in the end of 1798 so different from the former, and attended with so great fatality, that he made it the subject of a second paper[1]. It was preceded in the winter and spring of 1797–98 by a remarkable epidemic among the cats of London (an angina, with sanious discharge from the nostrils and running at the eyes), which killed "myriads" of them[2]. In Sept.–Oct. 1798, he heard that a scarlet fever

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[1] James Sims, M.D. "Sketch of a Description of a Species of Scarlatina Anginosa which occurred in the Autumn of 1798." *Mem. Med. Soc. Lond.* V. (1799), p. 415.

[2] This is the source of Noah Webster's information for London; he adds that the "cat distemper" appeared in Philadelphia in June, and was very fatal in New York and over the Northern States.

had been fatal to some adults about South Lambeth, and afterwards to several children there, five dying in one family and three in another. The swellings on each side under the jaw were so great as to force the chin up into the horizontal; there was much acrid foetid discharge from the nostrils, the pulse sank about the seventh day, and the scarlet eruption remained out until near death, which took place usually about the ninth or tenth day. Along with this malignant type, a mild or simple scarlatina was also prevalent. Sims wrote when the epidemic seemed to be "in its infancy," and so it proved; for Willan describes it as prevailing to the end of 1798 and rising still higher in the first months of 1799, his report for February and March being: "Scarlatina anginosa in its malignant form has been very prevalent, and has proved in many instances fatal; and in those who recovered, it produced after the cessation of the fever, anasarca, swelling of the abdomen, swelling of the lips and parotid glands, strumous ophthalmia, with an eruption of the favus, and hectical symptoms of long duration. The disease spread from London to the adjacent villages, and was almost universal in Somers Town during the month of February." It continued throughout the year, and into 1800, being second in importance among the epidemic maladies only to typhus, which, in that time of distress, was the grand trouble of the poorer classes in London. Willan's reports cease with the year 1800; but it appears from other sources that a very malignant scarlet fever and sore-throat prevailed in London in the summers and autumns of 1801 and 1802, becoming milder in 1803[1], and in various parts of England during the same three years. The provincial accounts for those years give the impression that this was the first general outbreak for some time, perhaps since the one described by Withering and others in 1778; and that is also suggested by the statistics of the Newcastle Dispensary: in the two first years of its practice, from 1 October, 1777, it treated 146 cases, with 18 deaths; in the next ten years 1779–1789, it treated only 57 cases, with 8 deaths; and from 1790 to 1802, it treated 152 cases, with 7 deaths[2]. Accounts of very general

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[1] E. Peart, M.D., *Practical Information on the Malignant Scarlet Fever and Sore-Throat.* London, 1802. See also *Med. and Phys. Journ.* IX. 16, report for Dec. 1802: "so very general that few of those who have continued in the same house have entirely escaped it"; and the reports, *ibid.* X. 76, 276.

[2] Clark, u. s. Monteith, *Report of the Newcastle Dispensary from its Foundation,* 1878.

scarlatina come from various parts of England. In the summer and autumn of 1801 it ran through many parishes of Cornwall, sparing others. In the parish of Manaccan, twelve out of the twenty-five burials in the year 1801 were from scarlatina—the malignant or putrid form, which was often fatal before the third day. In many other cases, the first untoward symptom was the dropsical swelling which came on as the fever went off. Three years after, in 1804, there was much scarlatina in and around Falmouth[1]. In 1805 it caused 12 in a total of 20 deaths in Revelstoke parish, South Devon.

In Northamptonshire in 1801 it was observed "in a form similar to the epidemic described by Dr Withering[2]." At Cheltenham in 1802 it was also compared to the epidemic described by Withering: "in consequence of the number of persons who have gone through the disease, it has for this month past (20th December) been gradually on the decline[3]." At Derby, in 1802, it had been the prevailing complaint in the last eight months of the year[4]. In the district of Framlingham, Suffolk, in 1802–3, it had proved very malignant and fatal in many families[5]. It is heard of also from Lancaster[6], and from various other parts of England, being casually mentioned in reports on the influenza of 1803.

To this period also belong several incidents of a kind that had attended scarlatina from its first appearance, namely, school epidemics of it. One of these was an outbreak in the Quaker boarding-school for boys and girls at Ackworth, in Yorkshire, in 1803. Although many of the children dispersed, yet no fewer than 171, in a total of 298 on the roll, were attacked with scarlatina in the course of four months, of whom seven died[7]. In the same year Dr Blackburne published a treatise on the preventive aspect of the disease, with directions for checking the spread of it "in schools and families[8]." It broke out in 1804 among the boys in Heriot's Hospital, Edinburgh, and in the city generally in 1805[9]. Ferriar makes mention of a "destruc-

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[1] Polwhele's *Cornwall.* Part VII. *Diseases,* p. 59.

[2] F. Skirmshire, *Med. Phys. Journ.* VI. 424.

[3] R. Freeman, *ibid.* IX. 157.

[4] H. Gilbert, *ibid.* IX. 249.

[5] Goodwin, *ibid.* IX. 509.

[6] Braithwaite, *ibid.* XI.

[7] Willan, *Cutan. Dis.* 1808, p. 379, particulars from Dr Binns, with full discussion of the methods of treatment. Willan was told by Dr Stanger that there were 71 cases in the Foundling Hospital from June to October, 1804, with 4 deaths.

[8] W. Blackburne, M.D., *Facts and Observations concerning the Prevention and Cure of Scarlet Fever, &c.* London, 1803.

[9] James Hamilton, M.D., *Obs. on the Utility, &c. of Purgative Medicines.*

tive epidemic of scarlet fever" in Manchester in 1805, which he supposed to have been introduced from Liverpool[1].

The general prevalence of malignant scarlet fever in the first years of the 19th century is farther shown by the accounts from Ireland, which were recalled by Graves in a clinical lecture of the session 1834–35, during the prevalence of a scarlet fever as malignant as that of thirty years before[2].

> "In the year 1801," he says, "in the months of September, October, November and December, scarlet fever committed great ravages in Dublin, and continued its destructive progress during the spring of 1802. It ceased in summer, but returned at intervals during the years 1803–4, when the disease changed its character; and although scarlatina epidemics recurred very frequently during the next twenty-seven years, yet it was always in the simple or mild form, so that I have known an instance where not a single death occurred among eighty boys attacked in a public institution. The epidemic of 1801-2-3-4, on the contrary, was extremely fatal, sometimes terminating in death (as appears by the notes of Dr Percival kindly communicated to me) so early as the second day. It thinned many families in the middle and upper classes of society, and even left not a few parents childless. Its characters seem to have answered to the definition of the scarlatina maligna of authors."

The long immunity from malignant scarlatina which Graves asserts for Ireland after 1804, is made probable also for England and Scotland after 1805, by the fewness of the references to it in medical writings. Bateman in 1804 resumed the regular reports on the prevalent diseases of London, which Willan had left off at the end of 1800, and continued them until 1816[3]; but he makes very few references to scarlatina compared with his predecessor. The two occasions when it is said to have been somewhat common were in 1807–8, during the severe epidemic of measles (and then it was "generally mild, presenting the eruption with a slight sore-throat"), and in 1814 when it was "very prevalent" along with measles. In Scotland during the same epidemic of malignant measles, in 1808, scarlatina was only occasional, and mild. It is heard of in its old malignant form from two localities of England, during the time of distress and typhus fever in 1810–11. At Nottingham it was "very prevalent, passing through whole families," in September, 1810, and in October became more violent and often fatal[4]. In the

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4th ed. Edin. 1811. App. III. p. 66 (three boys in Heriot's Hospital died of dropsy). Autenrieth, *Account of the State of Medicine in Great Britain*. Extracts translated by Graves, u. i.

[1] Ferriar, *Med. Hist. and Reflect.* III. 128.

[2] R. J. Graves, M.D., *A System of Clinical Medicine*. Dublin, 1843, p. 493.

[3] T. Bateman, M.D., *Reports on the Diseases of London, and the State of the Weather, from* 1804 *to* 1816. London, 1[illegible]9.

[4] Clarke, *Ed. Med. and Surg. Journn.* [illegible]x.

district around Debenham, in Suffolk, where it was last reported by the same observer in 1803, it made its appearance in February, 1810, in its very worst forms, causing deaths of children and adults in many houses, and destroying some children within forty-eight hours from the first attack. "All the surgeons for ten miles round have had to attend to scarlatina maligna in a variety of cases in all ages, from infants to fifty and sixty years." It was still raging in October, 1810, and was breaking out "in different spots around this country, that appear to have had no communication with the afflicted[1]."

It is not until 1831 that we begin to hear much of malignant scarlatina again. But it is clear that scarlet fever was common enough all through that interval, probably in its milder form. It was now the usual epidemic trouble of schools. In September and October, 1814, there were fifty-five cases, mostly mild, in children and two in adults in the Asylum for Female Orphans at Westminster[2]. In 1812 it was among the cadets in the Royal Military College at Marlow, having been followed by anasarca in only one instance[3]. Heysham, whose exact records of epidemics at Carlisle were made twenty or thirty years earlier, mentions casually in 1814 that scarlet fever had been "more frequent of late," but that it did not spread as formerly[4]. Other references to it in this interval are to show how seldom fatal it was under the cold water treatment or the lowering regimen[5]. At the Newcastle Dispensary fully twice as many cases of scarlatina were attended in the twenty-five years 1803–27 (795 cases) as in the twenty-five years 1777–1802 (355 cases); but in the larger total, which an increasing population might account for, there were actually fewer fatalities (30) than in the smaller (33); the highest number in any one year was 71 in 1824, of which every one is entered as having recovered. This is the impression derived from various sources—that the scarlatina from about 1803 until about 1830 may have been frequent, but that it was mild, or easily treated, or not often fatal. Macmichael, writing in 1822, not only testified that the "scarlatina

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[1] Goodwin, of Earlsoham, *Med. and Phys. Journ.* XXIV. 465.

[2] Samuel Fothergill, M.D. *Med. and Phys. Journ.* XXXII. 481.

[3] N. Bruce, *Med. Chir. Trans.* IX. 273.

[4] Heysham to Joshua Milne, in the latter's *Treatise on the Valuation of Annuities.* Lond. 1815. App. p. 755.

[5] Currie, *Med. Reports*, 1805, II. 458; Armstrong, *Pract. Illustr. of the Scarlet Fever, Measles, &c.* Lond. 1818; Lodge, of Preston, in *Med. and Phys. Journ.* XXXIII. (1815), p. 358.

of last summer was very mild," but argued that the malady in general was taken by many in those years in so mild a form that it was not recognized as scarlatina, "a name that sounds so fearfully in the ears of mothers," and a rare disease in families compared with measles or even with smallpox. His point is that scarlet fever was in fact as nearly universal as measles, but that, as it was often extremely slight, it passed for rose rash or the like; at the same time he identified these slighter forms with true scarlatina by simply pointing to the oedema which might follow them[1].

The testimony of Graves, of Dublin, who occupies many pages of his 'Clinical Medicine' with the disastrous scarlatina in various parts of Ireland about 1834, is conclusive that the severe type was new in the experience of that generation:

> "I have already mentioned that the disease called scarlet fever assumed a very benign type in Dublin soon after the year 1804, and continued to be seldom attended with danger until the year 1831, when we began to perceive a notable alteration in its character, and remarked that the usual undisguised and inflammatory nature of the attack was replaced by a concealed and insidious form of fever, attended with great debility. We now began occasionally to hear of cases which proved unexpectedly fatal, and of families in which several children were carried off; still, it was not until the year 1834 that the disease spread far and wide, assuming the form of a destructive epidemic[2]....Many parents lost three of their children, some four, and in one instance which came to my knowledge, five very fine children were carried off." The severe cases were mixed with others of scarlatina simplex. The violence of the attack lay in the throat-affection, the congestion of the brain, or the irritability of the stomach and bowels, nausea, vomiting and diarrhoea being early symptoms, as in the malignant sore-throat with rash a century before.

Graves proceeds, with much candour, to show how mistaken had been the reasons assigned equally for the mild type of scarlatina between 1804 and 1831 and for the severe type of it previous to 1804:

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[1] W. Macmichael, M.D., *A New View of the Infection of Scarlet Fever, &c.* London, 1822, pp. 30, 59, 78, 81–2. The title of another essay appears to reflect the same ideas, *Caution to the Public, or hints upon the nature of Scarlet Fever, designed to show that this disease arises from a peculiar and absolute virus, and is specifically infectious in its mildest as well as in its most malignant form.* By William Cooke, London, 1831.

[2] Kreysig, "Ueber das Scharlachfieber," *Hecker's Annalen*, IV. 273, 401, 1826, says that scarlatina had been "not only almost uninterrupted in all Europe since twenty-six or twenty-seven years [1799 or 1800], but also frightfully fatal." The period in which this was written appears to have been one of fatal scarlatina in some parts of Germany; so also the years 1817–19, and the years 1799–1805 (as in Great Britain and Ireland). But the sweeping assertion as to frightful scarlatina mortality in all Europe without interruption since 1799 is clearly a flight of rhetoric, and is as nearly as possible the reverse of the truth so far as concerns Britain and Ireland.

"The long continuance of the period during which the character of scarlet fever was either so mild as to require little care, or so purely inflammatory as to yield readily to the judicious employment of antiphlogistic treatment, led many to believe that the fatality of the former epidemic was chiefly, if not altogether, owing to the erroneous method of cure then resorted to by the physicians of Dublin, who counted among their numbers not a few disciples of the Brunonian school; indeed, this opinion was so prevalent, that all those whose medical education commenced at a much later period, were taught to believe that the diminished mortality of scarlet fever was entirely attributable to the cooling regimen and to the timely use of the lancet and aperients, remedies interdicted by our predecessors. This was taught in the schools, and scarlet fever was every day quoted as exhibiting one of the most triumphant examples of the efficacy of the new doctrines. This I myself learned—this I taught: how erroneously will appear from the sequel. It was argued, that had the cases which proved fatal in 1801–2 been treated by copious depletion in their very commencement, the fatal debility would never have set in, for we all regarded this debility as a mere consequence of previous excessive reaction. The experience derived from the present [1834–35] epidemic has completely refuted this reasoning, and has proved that, in spite of our boasted improvements, we have not been more successful in 1834–5 than were our predecessors in 1801–2."

From 1829 to 1833 there are numerous references to the scarlatina maligna in England and Scotland: at Plymouth[1] in 1829, Bridlington[2] in 1831, Baddeley Green, Brown Edge, and other places in Staffordshire[3] in the summer of 1831, Beaconsfield, Bucks[4], in 1832, Edinburgh[5] in 1832–1833. It is in 1830 that scarlet fever begins to have a line to itself in the old and inadequate bills of the Parish Clerks of London, the deaths that year being 94; in the next seven years they are 143, 388, 481, 523, 445, 261 and 189. In 1835 we begin to have statistics of the deaths from it in Glasgow[6] for five years, during which they fell much below the deaths from either measles or smallpox.

Deaths from Scarlatina in Glasgow.

	Under one	1–2	2–5	5–10	10–20	20–30	30–40	40 and up.	Total
1835	27	50	89	73	23	7	2	2	273
1836	34	57	136	86	25	9	5	3	355
1837	4	9	34	22	5	3	1	1	79
1838	3	15	42	17	7	1	1	1	87
1839	29	45	104	74	10	—	—	—	262

The two first years of this period, which had the most scarlatina deaths, correspond to the years of the Dublin

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[1] Blackmore, *Lond. Med. Gaz.* VI. 114.

[2] Sandwith, *Edin. Med. and Surg. Journ.* XL. 249.

[3] Aulsebrook, *Lancet*, 12 Nov. 1831, p. 217: cases of very malignant suddenly fatal scarlatina in infants and young persons up to the age of twenty-two. In the house of a canal boatman a son and two daughters, from 21 to 13 years, died in the course of two days after a very sudden and brief illness.

[4] Rumsey, *Trans. Prov. Med. Assoc.* III. 194.

[5] Hamilton, *Edin. Med. Surg. Journ.* XXXIX. 140.

[6] Cowan, *Journ. Statist. Soc.* III.

epidemic, and were also the years when it was common in Edinburgh[1]. Probably the smaller mortality of Glasgow in 1837 and 1838 was general; for, when registration of the causes of death began in England and Wales in the latter half of 1837, it found the scarlatina mortality at a much lower figure than it reached in 1839 and continued to keep thereafter.

Scarlatina since the beginning of Registration, 1837.

The first returns of the causes of death under the new Registration Act happened to correspond with a great epidemic of typhus fever, and with an equally great epidemic of smallpox which took its victims in largest part among infants and young children. The deaths from scarlatina were also considerable during those two years and a half; but in 1840 scarlatina nearly doubled its mortality, and continued year after year for a whole generation to be the leading cause of death among the infectious maladies of childhood. The figures for England and Wales are given in a table at p. 614, in comparison with the annual deaths by smallpox, measles, and diphtheria. The enormous number of deaths from scarlatina during some thirty or forty years in the middle of the 19th century will appear in the history as one of the most remarkable things in our epidemiology. There can be no reasonable doubt that this scarlatinal period was preceded by a whole generation with moderate or small mortality from that disease, just as it is now being followed by annual death-rates which are less than a half, perhaps not more than a third, of the average during forty years before 1880.

The first great epidemic all over England was in 1840 (it had reached a maximum in London the year before), another came in 1844, a third in 1848 (in which the London death-rate was 2·12 per thousand living). In the next decennial period, 1851–60, the worst years for scarlatina were 1858–59, which were also the years of the return of diphtheria; in the period 1861–70, the great scarlatinal years were 1863–64 and 1868–70; in the period 1871–80, the year 1874 was the epidemic year. The annual average death-rates per million inhabitants in all England and Wales were as follows in four decennial periods:

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[1] Sidey, Stark and others in *Edin. Med. and Surg. Journ.* 1835–36. H. Kennedy, M.D., *Account of the Epidemic of Scarlatina in Dublin from* 1834 *to* 1842. Dublin, 1843.

1851-60	832	1871-80	716
1861-70	972	1881-90	338

In the greatest epidemic years since 1863 the death-rates per million for the whole country have been:

1863	1498	1869	1275
1864	1443	1870	1461
1868	1020	1874	1062

In those years scarlatina made from four to six and a half per cent. of the deaths from all causes.

While no county of England has been free from this infection, the bulk of the deaths have fallen upon the capital, the great Lancashire and West Riding towns, the Black Country of Staffordshire with Warwickshire, the mining districts of Durham and South Wales, and, in the earlier part of the period, upon the south-western counties.

Highest Mortalities by Scarlatina in three Epidemics.

	1863	1864	1868	1869	1870	1874
England and Wales	30475	29700	21912	27641	32543	24922
London	4955	3244	2916	5841	6040	2648
Lancashire	4580	4854	4445	4890	3702	6404
West Riding	2218	3135	1676	2870	3718	3779
Durham	1211	403	2678	1512	983	1941
South Wales	501	1990	285	804	1370	1388
Staffordshire	1147	1134	943	1198	1064	1270
Devonshire	778	1054	60	155	646	72
Cornwall	995	572	254	161	587	50
Somerset	773	1013	55	154	584	173

In Lancashire and South Staffordshire there has been less fluctuation of the mortality from year to year than elsewhere. The stress of an epidemic has not fallen equally on all the principal centres in the same year or years: thus Durham has had the epidemic in advance of other centres, while South Wales has had it in arrear. The decline of the south-western counties from their leading position in 1863-64 has been remarkable. Plymouth, Devonport and Stonehouse, which had contributed most to the high scarlatinal death-rate of Devonshire in 1863-64, were found on the average of the next decennial period to have low rates from scarlatina, but death-rates from measles which were unapproached in any other region of England. In the following table four Devonshire towns are

compared with certain Staffordshire registration districts in which the scarlatinal death-rate has remained high.

Annual average Death-rates per 1000 *living*, 1871–80.

	All causes	Scarlatina	Measles
Plymouth	22·63	·25	1·13
E. Stonehouse	28·23	·33	1·79
Stoke Damerel	20·42	·37	1·19
Exeter	24·99	·50	·82
Stoke-on-Trent	25·80	1·22	·49
Wolverhampton	22·78	1·05	·35
Walsall	22·82	1·21	·30
Dudley	24·24	1·18	·59

This looks like a correlation between measles and scarlatina. The excessive death-rate from measles in Plymouth, Stonehouse and Devonport was due to a disastrous epidemic in the last two years of the decennium, 1879 and 1880 (338 deaths at Plymouth, 121 at Stonehouse, and 235 at Devonport). Measles remained high in Plymouth all through the next decennium, scarlatina still continuing low until the very end of it, when in 1889 there was a mortality of 270, equal to a death-rate of 3·39 per 1000 living. In like manner Stoke-on-Trent had its great epidemic of measles in 1888, causing 342 deaths, or a rate of 2·8. The high Plymouth death-rate, after nearly twenty years with extremely little scarlet fever, was surpassed in 1882 by an epidemic of 346 deaths in the colliery townships of Aberystruth and Tredegar, Monmouthshire, equal to a death-rate of 6·1 per 1000. Other high death-rates for single years were at Wakefield and Swansea in 1889 and at Neath in 1890. The highest death-rates from scarlatina on an average of ten years, 1871–80, were at Durham 1·70, Todmorden 1·64, Auckland 1·63, Gateshead 1·60, Sheffield 1·49, Leigh 1·41, Wigan 1·30, Newcastle 1·28. The purely agricultural counties have the lowest death-rates[1].

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[1] The principal epidemics of scarlatina which have been inquired into by inspectors of the medical department since 1870 have been the following:

In 1870, Camborne, Wing.
1873, Fleetwood-on-Wyre.
1874, Hetton (Durham).
1877, Massingham, Portsmouth.
1879, Pontypool, Easington (Durham), Fallowfield (near Manchester), Yeadon.
1880, Bedlington (near Morpeth), Stourbridge, Swindon, Castleford, Llanelly, Huntingdon, Barkingside (Orphans' Home near Romford).
1881, Durham, Halifax, Thame.
1882, Bedwelty (Tredegar and Aberystruth), Potton.
1883, Sutton in Ashfield, Thorne, Donington and Moulton (Spalding).
1885, Sandal (near Wakefield).
1886, Atherton, Hayfield, Hindley, Wombwell.
1889, Spennymoor (Durham), Macclesfield, Faringdon, Brixham.

As to age-incidence, the proportion of deaths under five has been almost exactly two-thirds steadily for the last four decennial periods (supra p. 625). The following table by Dr Ogle, the Superintendent of Statistics, shows both age and sex of the scarlatina mortality[1]:

Mean annual Mortality from Scarlet Fever per million living at successive age-periods 1859–85. *England and Wales.*

Age	Males	Females
0—1	1664	1384
1—2	4170	3874
2—3	4676	4491
3—4	4484	4332
4—5	3642	3556
0— 5	3681	3482
5—10	1667	1613
10—15	346	381
15—20	111	113
20—25	59	77
25—35	36	58
35 and upwards	13	15
All ages	778	717

From certain hospital statistics on a large scale, and some figures of cases and deaths at Christiania, it was also found that the attacks of scarlatina were much more fatal in the first years of life, the fatality decreasing rapidly after five. This was only to be expected. But it was somewhat surprising to find that more girls were attacked than boys, while the fatalities among boys were more than among an equal number of girls at all ages until womanhood, when the few females attacked by scarlatina had more fatalities among them than the somewhat fewer males of the same ages. A slight excess of fatality in the female sex over the male between the ages of ten and twenty years, is shown also for smallpox by the table at p. 618. Recent notifications of infectious diseases to medical officers of health have enabled a comparison to be made between the number of cases of scarlatina notified, with age and sex, and the number of deaths certified in the corresponding time and place to the Registrar-General; from which the above generalities as to the proportions of fatal cases in the several age-periods of either sex have been confirmed[2].

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[1] William Ogle, M.D., in the *49th Report of the Registrar-General* (*for* 1886), p. xiv.

[2] See a paper, with Tables, on "Age, Sex and Season in relation to Scarlet Fever," by Arthur Whitelegge, M.D. in *Trans. Epidemiol. Soc.* N.S. VII. p. 153, for Nottingham and some other towns. A paper by Dr Ballard, "On the Prevalence

The enormous mortalities of some years may be taken to have depended in part upon an increased prevalence of the disease, but still more upon an increased fatality among the subjects of it. Since the establishment of the Metropolitan Fever Hospitals in 1870 the percentage of deaths to cases has ranged from 15·3 in 1879 to 6·6 in 1873 and 6·7 in 1891. Among the smaller totals of the London Fever Hospital the percentage of deaths has ranged even more widely from year to year[1]. What is thus statistically proved is also a matter of common experience; there have been whole epidemics, extending perhaps over two or three years, marked by high malignancy, and epidemics just as uniformly marked by mildness of type. The severe type has usually been made by the sloughing in the neck or throat; but there has also been a class of cases tending to a fatal issue early in the attack by a sunken pulse and with few external manifestations. The cause of these variations in the severity of scarlatina is the old problem of epidemic constitutions: sometimes the constitution is "putrid" or "pestilential" or malignant, sometimes it is mild or benign.

Graves, in the passage above cited, has sufficiently exposed the fallacy of attributing changes of type to modes of treatment. On the other hand there is reason to think that the percentage of deaths (by which the "type" is usually judged) is higher in children carried off to hospitals than in those treated at home. As the same fact has been uniformly observed in epidemics of Asiatic cholera, when the ambulances have been almost as busy as those of the Metropolitan Asylums Board during an ordinary autumnal rise of scarlatina, it is probable that the reasons which used to be given in the former case hold good also in the latter.

Scarlet Fever in London, 1890 *and* 1891.

Year	All Cases Notified	Treated at Home	Treated in Hospital	Fatalities at Home	Fatalities in Hospital
1890	15330	8793	6537	348 or 3·95%	510 or 7·8%
1891	11398	6136	5267	232 or 3·8%	357 or 6·8%

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and Fatality of Scarlatina as influenced by Sex, Age and Season," which was written twenty years before but left unpublished, follows Whitelegge's in the *Trans. Epidem. Soc.* N.S. VII. (1887–8).

[1] A table of figures showing this will be found in Dr B. A. Whitelegge's second lecture on "Changes of Type in Epidemic Diseases." *Brit. Med. Journ.* 4 March, 1893.

This is a comparison of two parts of the same epidemic, which had a very moderate fatality in any case. The real problem of malignity or severity of type arises over such epidemics as those of 1840, 1848, 1858–59, 1868–70 and 1874, in which the doubling of the deaths, for one year, or for two or even three consecutive years, had depended less upon an increased number of seizures than upon a higher ratio of fatalities. An explanation for each occasion will have to be sought either in the condition of the patients, or in the inherent properties or external favouring circumstances of the virus. As to the former, the most fatal epidemic years of scarlet fever have not been marked in any such uniform way as the great seasons of typhus or relapsing fever; nor is scarlatina an infection that keeps mainly within the poorer classes. Among factors of the external kind, a rainfall below the average has been thought a relevant thing: thus in the three years 1862–64, the annual average rainfall at Greenwich was only 20·6 inches, the scarlatina death-rate in London for the same years reaching the high figure of 1·33 per 1000 inhabitants; in the next three years, 1865–67, the death-rate fell to ·56 (it would have fallen in any case), while the rainfall reached the very high average of 29 inches; in the three years following, 1868–70, the death-rate reached the excessive annual average of 1·5 per 1000 in London, the rainfall of the same period averaging only 22·3 inches. Thereafter for a number of years the rainfall was moderate and the scarlatina death-rate low; but in the years 1883–87, they were both low together, the scarlatina death-rate of ·26 being lower than it had ever been since registration began[1].

Although an empirical correspondence between the great scarlatina periods and a series of dry years has not been made out without important exceptions, hitherto unexplained, yet there is a very obvious correspondence between the great rise of scarlatina deaths in London every year and the season of late autumn, which is the season when the ground-water touches its lowest level or begins to rise therefrom to the high water-mark of spring. Of all the curves of seasonal rise and fall constructed by Buchan and Mitchell from the weekly bills of mortality in London from 1845 to 1874, that of scarlatina is the most

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[1] Longstaff, *Trans. Epid. Soc.* N.S. IV. (1880), 421, and *Studies in Statistics.* London, 1891, p. 310. D. A. Gresswell, *Contribution to the Natural History of Scarlatina.* Oxford, 1890, p. 193.

decided next to that of infantile diarrhoea, the deaths rising in October and November far above the mean line of the year, and falling farthest below the mean in spring and early summer[1]. This was an old observation—by Sydenham for the scarlatina simplex of that age, by Willan in the end of the 18th century (one or two spring epidemics being remarked upon as exceptional). It is a very curious fact, and one that is as certain (for London at least) as it is curious. Sydenham explained it by the doctrine of his time, that the favouring things were in the human body, namely, some susceptibility of the humours owing to the heat of the preceding summer; but, according to modern views, it should bring scarlatina into the same class with the soil-poisons of enteric fever, yellow fever and cholera, which are believed to become more rife owing to the greater activity of their respective miasmatic viruses when the pores of the ground are occupied to the greatest depth with air in place of water.

It would be singular indeed if, after all, we should have to include scarlatina among the miasmatic diseases; for it is an exquisite instance of an infection which is passed from person to person, or by the agency of volatile contagion, or by fomites in clothes, bed-linen, house-furnishings and the like. The controversy which has raged so keenly in the past between contagionists and non-contagionists over the instances of plague, yellow fever and Asiatic cholera, would become still more keen over scarlatina—and be still more confused if it were not stated in more correct terms at the outset. What we all find so hard to learn is, that the one way of infection does not exclude the other. Plague was for the most part a miasmatic infection in the air of a plague-stricken town; but it could be conveyed in clothes or bales, while it was prudent to remain not too long in the company of a plague-patient. In like manner contagion from the person was, as Rush said and Blane confirmed, a "contingency" in yellow fever; and there are some authentic cases of Asiatic cholera which cannot well be explained except on the hypothesis of contact with the persons of those sick or dead of the disease. Scarlatina is more contagious than any of these, because it shows so much on the surface of the body and scatters its infective matter into the atmosphere of a room with the fine scales or dust of desquamation. Still, there are conditions for the contagiousness of scarlatina, just as there are for the rarer event of

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[1] *Journ. Scot. Meteorol. Soc.* July, 1874, p. 195.

contagion from the persons of the sick in the plague, yellow fever and cholera. It is a remarkable fact that scarlet fever should ever be sporadic, that a single case should appear in the midst of a crowded population (as I have seen in a coast town filled with strangers during the herring fishery to the extent of one-half more than its usual numbers), and no other cases follow for months after, although there had been not the smallest attempt at isolation. Every medical practitioner knows, if some laymen and legislators do not, that scarlatina is sometimes highly contagious, and sometimes hardly contagious at all; and who can say whether the mechanical routine of "stamping out" contagion, which certain persons pursue with more zeal than knowledge, may not be the means of turning a mere potency into an actuality? The tact of individuals rather than the grinding machinery of an Act of Parliament is needed in dealing with vagaries such as Willan thus describes:

> "I have seen in numerous families one child have scarlatina without communicating it to any of the rest; yet, perhaps, in the succeeding autumn, several of them were infected by only passing near a patient recovering from the disease, or by touching those who had a little time before visited some persons affected with it[1]."

There are two special forms of epidemic scarlatina which may prove to be finger-post instances for the general pathology. It happens from time to time in the surgical wards of hospitals for children, where many cases of suppurating diseases (especially of the bones or joints) are aggregated and kept together perhaps for months, that groups of the patients acquire a scarlet rash, or an erysipelatous rash, or a hybrid form of rash, along with the constitutional symptoms of scarlatina. Whether it be from the suppuration, or from the blood of operations, this disease must be reckoned a product of so-called "hospitalism." It is not without significance that there may be an element of erysipelas in such cases. They are probably cases of "blood poisoning," in a double meaning of the term—poisoning of the living blood by dead blood or by pus which is closely allied to blood[2].

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[1] *Cutaneous Diseases.* Vol. I. 1808, p. 254.

[2] An unfortunate event that came under the writer's notice some years ago may be illustrative of this. Two women with cancer of the breast were operated on, the one after the other, in the same operating theatre. Their beds were in the same hospital ward, but separated by the whole length of the ward. A few days after the operations, one of the women developed erysipelas, which was most extensive on the back; very soon after the other woman got the disease in a precisely similar way; they both died of it. As it seemed improbable that No. 1 had been infected in the ward, or that No. 2 had been infected from No. 1, (some dozen surgical cases

The other special kind of epidemic scarlatina is that which has broken out among the inmates of houses supplied with milk from a common source. There have been many such outbreaks, including one most remarkable instance in which a large number of guests at an evening party, who had partaken of cream with strawberries, were shortly thereafter attacked by scarlet fever at their widely scattered homes. There can be no question that milk, or cream, has been the vehicle of scarlatinal infection. The first hypothesis tried was that of scarlatina on the dairyman's premises; the effluvia of a scarlatinal patient might have become mixed with the milk. In some instances, it was actually shown that there had been a case or cases of scarlet fever among the dairyman's children; but there were other instances in which that could not be shown, and it was, of course, possible to refer the cases, where they did occur, to a common cause in the milk used at the dairy and in the milk distributed from it. As more and more outbreaks of the kind came to be investigated, it was indeed made probable that the infection had got into the milk from the cow[1]. Someone threw out the suggestion that the cow suffered from scarlet fever, the sign of it being soreness of the paps. Without taking seriously so random a hypothesis as that, we find much agreement as to the fact that the cows, to which the contaminated milk has been traced, were affected, one or more of them, with sore paps. In some cases the disease of the teats had been admitted to be the same as cowpox; in other cases that has been denied; in a third variety, a cow has had cowpox on one teat and something else on another. It matters little what name be given to the affection of the cow's paps. All soreness of the skin of the teats has the same effect so far as concerns the purity of the milk. Unless the milk be drawn off by a catheter (according to a German practice), the paps are necessarily made to bleed by being "stripped"; it has been

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between them escaping,) the suggestion arises of a common source of both infections in the operating theatre. The operating table was covered by a woollen cloth, of red colour so as not to show blood stains; it must have contained a good deal of putrid invisible blood from former operations.

[1] The first instance showing this came from a dairy at Hendon. See James Cameron, M.D. *Trans. Epid. Soc.* V. (1885–6), p. 104; and *ibid.* VIII. 40. One of the latest and most fully investigated came from a dairy near Glasgow, J. B. Russell, M.D., LL.D., and A. K. Chalmers, M.D. *Glas. Med. Journ.* Jan. 1893, p. 1. An outbreak at Wimbledon and Merton is described, *Rep. Med. Off. Loc. Gov. Bd.* for 1886, p. 327. See also *ibid.* for 1882, p. 63. The scarlatina caused by cream (with strawberries) is traced, *ibid.* for 1875, p. 72. A very clear case of scarlatinal epidemic due to contaminated milk occurred at Blackheath, both among children and adults, in April, 1894.

admitted by milkers that the blood, pus, and scabs are apt to become mixed with the milk; and the discharges from the sore paps have actually been seen, by a scientific witness, to trickle over the fingers of the milkers into the milk-pail[1]. The contamination of the milk which produces scarlatina in those who use it is neither more nor less specific than that. The disease is blood poisoning in the double sense of the term—poisoning of the living blood by dead blood. Blood is a peculiar fluid, and so is milk. When the two come together the result is peculiar. Both are animal fluids that curdle by some peculiar ferment-change in their constituents. Again, milk is peculiar in its property of taking up organic effluvia; thus the milk standing in shallow vessels has been known to acquire the taste and odour of tar from a tarpaulin in the adjoining farm-yard. With such properties of the milk, a small quantity of blood or pus in it will go a long way.

The one thing that connects the scarlatina of surgical wards in children's hospitals and the scarlatina of the milk-pail is putrefying blood or pus: the disease is a septic effect of blood, just as a scarlet rash is known to be a toxic effect of very various drugs in peculiarly susceptible subjects. The obviously septic varieties of scarlatina make but an insignificant part of the whole; but they may be finger-post instances. Thus, if we assume that the infection may be miasmatic from the ground as well as contagious from the person. there are certain facts, or suspicions, that will fit the hypothesis of putrefying blood. A theory of scarlatina was put forward in 1871, on the basis of observations near Croydon, that its virus came from the blood and offal of slaughter-houses collected at particular spots to be used as manure[2]. The first death in a recent small epidemic within the writer's knowledge was of a school-girl who lived just across the road from a slaughter-house. The septic hypothesis of scarlatina might be made to include other corrupting animal matters. Some practitioners have a suspicion that scarlet fever is bred in the atmosphere of a horse-mews. On the greater scale, others have traced a connexion between the more signal outbreaks of angina maligna and preceding murrains

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[1] E. M. Crookshank, *Path. Trans.* xxxix. 382, in an extensive prevalence of cowpox on a dairy farm near Cricklade. No scarlatina could be traced in the neighbourhood.

[2] Alfred Carpenter, M.D. *Lancet*, 28 Jan. and 4 Feb. 1871.

of cattle[1]. The animal matters which may become toxic to man, in miasmatic or other form, are indeed many. If scarlatinal drug-eruptions are any clue to the mystery of scarlet fever, we need not be surprised to find a somewhat uniform disease-effect produced by a variety of septic agents[2]. But, in that hypothesis, the refuse of the shambles will merit most attention. This was thought the one great nuisance of London in the sanitary ordinances of Edward III., Richard II. and Henry VII.; it was then considered a danger to health in the measure of its offensiveness to sight and smell, but there may still be dangers from it which are subtle and unperceived.

Reappearance of Diphtheria in 1856–59.

The memorable outburst of epidemic throat-disease in Britain about the years 1858–59 was part of a sudden uprising of the malady all over the globe—in Europe, America, North Africa, India, China, and the Pacific[3]. It was only in some parts of France, and of Norway and Denmark, that "diphtheria" had been epidemic in the generation before. Of its novelty to nearly the whole British profession in 1858, familiar as they were with the angina of scarlet fever, there can be no question. Its appearance among diseases coincided with the publication of Darwin's hypothesis of the origin of species by natural selection; and it was in the terms of that hypothesis that Farr, of the Registration Department, spoke of the phenomenon of diphtheria. New diseases, he said, "are only recognized as distinct species when they have existed for some time. Diphtheria is an example. It obtains a distinct line in the Tables of this year [1859] for the first time"—with a total of 9587 deaths. For four years before that, it had been in a "provisional table" under the names of "diphtheria" and "cynanche maligna"; but in the general table, the deaths under these names had been merged with the scarlatinal deaths. This inclusion for a time of diphtheria under scarlatina could not have been because practitioners had any difficulty in diagnosing the one from the other,

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[1] Wall, *Gent. Magaz.* 1751, p. 71, 501. He quotes Severinus to the effect that the great epidemic of *garrotillo* in the province of Naples in 1618 was preceded by a murrain.

[2] Prince A. Morrow, "Drug Eruptions," edited for the New Sydenham Society by T. Colcott Fox, in *Selected Monographs on Dermatology*. London, 1893.

[3] Hirsch, III. 87.

but probably because scarlatina anginosa seemed the nearest affinity in the nosological system. Diphtheria in 1858 had no scarlet rash, and yet it was supposed to be the same disease that had made so much commotion in England about the middle of the 18th century: "In Fothergill's account," says Farr, "the symptoms are confused by the introduction of the eruption of scarlatina into his description"—as if his description had been a patchwork of his fancy, with some characters taken from "diphtheria" and some from scarlet fever. The greatest of our nosologists, Cullen, had long before that separated "cynanche maligna" from "scarlatina anginosa," but the separation was not made on the ground of absent or present rash. Both had the rash, the cynanche having, besides a general exanthem, very distinctively the peculiar scarlet redness, with swelling and stiffness, of the fingers which Fothergill described, while the scarlatina rash was "commonly more considerable and universal." Both also might have a discharge from the nose; but when the coryza did occur in scarlatina, "it is less acrid, and has not the foetid smell which it has in the other disease." It was really on the ground of malignancy or fatality that Cullen separated them. In forty years he had seen scarlatina anginosa six or seven times prevailing as an epidemic in Scotland, and he had seen two or three epidemics of cynanche maligna. He had seen mild cases in the latter, as well as in the former; but whereas there would be only one or two malignant cases in a hundred of scarlatina anginosa, the malignant or putrid cases in an epidemic of cynanche were four-fifths of the whole[1]. On the other hand Willan, writing just fifty years before the modern diphtheria made its appearance, maintained that "no British author has yet described any epidemical and contagious sore-throat except that which attends the scarlet fever," not even Starr, whose "morbus strangulatorius" he held to be "the most virulent form of scarlatina[2]."

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[1] Cullen, *First Lines of the Practice of Physic*, Part I., Book II. chap. 5, § 2, and Book III. chap. 4.

[2] *On Cutaneous Diseases*, vol. I., London, 1808, pp. 319, 326, 333. He included also the *garrotillo* of Spain and the throat-plague of Naples (1618) among the "varieties of scarlatina," inasmuch as they had not unfrequently a rash which was of the erysipelatous kind. Hirsch (u. s.) and Max Jaffe ("Die Diphtherie in epidemiologischer und nosologischer Beziehung vornehmlich nach Französischen und Englischen Autoren zusammengestellt," Originalabhandlung in *Schmidt's Jahrbücher*, CXIII., 1862, pp. 97–120) do not seem to doubt the diphtheritic nature of the *garrotillos* of Spain and Italy in the 16th and 17th centuries, but they agree with Willan in classing most of the 18th century throat-distempers of English and American writers as scarlatinal,

The name diphtheria, which appeared for the first time among the classified causes of death in England in the report for the year 1855 (published two years after), had been given originally in 1826, with the termination *itis* according to the then Broussaisian fashion, by Bretonneau in his account of epidemics at Tours in 1818–21 and at La Ferrière in 1824–25[1]. It was in January, 1855, or just before the disease became general in Europe, that he changed the termination to *diphthérie*[2]. This name was taken from διφθέρα, a prepared skin or hide, suggesting in strict correctness, a certain toughness and texture which were actually found in only a small proportion of all the diphtheritic deposits or exudations or sloughing infiltrations in the first great epidemic and subsequently.

The interval between 1793–94, the date of Rumsey's diphtheria or "croup" at Chesham, and the outbreak of diphtheria in England in 1856–59, affords several instances of the disease, some of which were contemporaneous with Bretonneau's in France, but were still called "croup" in this country. These I shall merely enumerate in a note, passing at once to the beginnings of the great outbreak[3].

The first public notice of the reappearance of a fatal throat epidemic in England appears to have been in the Registrar-

reserving as diphtheritic, or as more nearly allied to diphtheria, Starr's "morbus strangulatorius" of Cornwall, some cases of infants recorded by Denman (*supra*, p. 714), Rumsey's cases of "croup" (*supra*, p. 716), and the epidemic described by Bard, of New York (*supra*, p. 690). These matters of identification appear to be like matters of taste, for which the best rule is *non disputandum.* I have already pointed out that Bard himself did not hesitate to identify the epidemic throat-disease of his time with that which Douglass had described in New England thirty years before.

[1] P. Bretonneau, *Des inflammations spéciales du tissu muqueux et en particulier de la Diphthérite*, Paris, 1826, with supplement in 1827.

[2] Id. *Arch. gén. de méd.*, Jan., 1855.

[3] Mackenzie, *Ed. Med. and Surg. Journ.*, April, 1825, p. 294, and *Med. Chir. Rev.*, 1827, p. 289, for Glasgow in 1819. The disease which Mackenzie called croup, was generally known in Glasgow at that time as "croupy sore throat." It was very fatal, attacking several children in the same family, was reckoned contagious, was not a modification of scarlatina, was very different from idiopathic croup as it began on the tonsils and descended to the larynx and trachea, and, lastly, was sometimes marked by gangrenous foetor.

Robertson, *Edin. Med. and Surg. Journ.* (1826) XXV. 279, for Kelso in 1825.

Bewley, *Dub. Journ. of Med. Sci.* VIII. 401, for Dublin in 1835–36. An outbreak observed by Brown, at Haverfordwest, in 1849–50, involving some 200 cases and 40 deaths, was identified in 1858 with diphtheria (*Med. Times and Gaz.*, May, 1858, p. 566, see also *Med. Chir. Trans.* XL. 49). Outbreaks more vaguely recalled in 1858 as diphtheria occurred at Ashford in 1817, and at Leatherhead (30 deaths in the workhouse) at an uncertain date (*2nd Rep.* (1859) *Med. Offices Privy Council*, pp. 244, 320). F. Ryland, *Diseases and Injuries of the Larynx and Trachea*, London, 1837, pp. 161–175, described a similar disease as a complication of measles at Birmingham in 1835.

General's third quarterly report of the year 1857, when attention was drawn to the remarks by various local registrars (Thame, Billericay, Maldon, Liskeard, Truro and Chesterfield) as to fatalities from "inflammation of the throat," "putrid sore throat," "malignant sore throat," "disease in the throat," and "throat-fever." About this time it was also called the "Boulogne sore throat." There had been an epidemic at Launceston from 30 September, 1855, which had come to a height in August, 1856; several deaths had occurred near Spalding, in Lincolnshire, in July, 1856, and the disease had been seen at Ash, in Kent, in November, 1856. When the registered causes of death during the year 1855 were classified (in 1857), "diphtheria" was credited with 186 deaths, in the Supplementary Table then first introduced, "cynanche maligna" having 199 deaths. The following shows the progress of the epidemic during the four first years, and the mode of entry:

Year	Cynanche maligna	Diphtheria	Scarlatina (inclusive of columns 1 and 2 in the general table)
1855	199	186	17,314
1856	374	229	14,160
1857	1273	310	14,229
1858	1770	4836	30,317

In 1857 and 1858 the deaths from croup were above the average, and probably included some of the new disease.

Accounts of the epidemic began to come into the medical journals[1] from various localities in the course of 1858,—from Lincolnshire, Essex, Kent, Sussex, &c. A systematic inquiry, conducted by Greenhow and Sanderson for the Medical Department, under the direction of Simon, gave an exact picture of the several degrees of throat-distemper that constituted the epidemic in the year 1858, in certain of the more severely visited centres of Lincolnshire, South Staffordshire, Cornwall, Kent, and other counties[2]. The numerous cases of throat disease occurred often in the midst of scarlatina, but sometimes also where there was no scarlatina. One of the worst centres was in

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[1] *Med. Times and Gazette, Lancet, British Med. Journal, &c.* for 1858 and 1859. See references in Hirsch, III. 89.

[2] *Second Report* (for 1859) *by the Medical Officer of the Privy Council*, London, 1860, p. 161 *seq.* Dr Greenhow published an essay on Diphtheria in 1860. Lectures important for the nosological definition were published by Sir William Jenner in 1861 (reprinted in 1893). Other essays called forth by the epidemic were by W. F. Wade (1858), Ernest Hart (1859), Edward Copeman (Norwich, 1859). Christison, J. W. Begbie and others wrote upon it in Scotland.

and around Spalding, a market town situated in a flat grazing country within the fen district of Lincolnshire. A thousand cases were counted in and near Spalding, many of them mild, a small ratio of them gangrenous and mortal; one practitioner had 200 cases with 5 deaths, another 200 cases with 2 deaths, another 160 cases with 17 deaths (of 65 tabulated with 9 deaths, which occurred in 35 houses, the first four all died from gangrene in June, 1858). The doctor at Pinchbeck, in the same district, had some 500 cases of which 300 occurred in the space of about six weeks; most of the 19 deaths in his extensive series happened in the first cases (this was observed also in the New Hampshire epidemic of 1735). At Launceston, in Cornwall, there were about a thousand cases known, the height of the epidemic having been in the summer and autumn of 1856; among 126 taken as they came in 98 families, 18 died. The mildest and the most severe cases were equally parts of the epidemic constitution, and occurred side by side in the same households; many of them were quinsies, ulcerated sore-throats, or the like, others were gangrenous. In this great variety, only a part could be reckoned "true diphtheria." From the first, the remarkable sequel of paralysis, not only of deglutition but of the motor powers generally, was remarked here and there. Sometimes an eruption of the skin was seen, but desquamation did not occur[1]. Albumen in the urine was somewhat constant. It is noteworthy, the more so that the coincidence was not remarked at the time, that the true diphtheritic pellicle,—tough, leathery, elastic,—was found most distinctively, if not exclusively, where it was found in 1748, namely in Cornwall[2].

Although the epidemic was not confined to low and damp situations, yet there was no mistaking the severity of it in Lincolnshire; and although it fell upon both clean and filthy houses, yet it is probable that the cases with most pronounced

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[1] Mr Jones, of Fletching, Sussex, wrote that scores of cases (probably at least 50 or 60) have had more or less eruption. In one case it was general and bright...It was like scarlatina...but the whole surface was covered with minute miliary vesicles of clear fluid, 'one mass of small vesications.' There was a great deal of itching and no subsequent dropsy. In other cases the eruption was partial. *Rep. Med. Off. Privy Council*, II. (1859), p. 284.

[2] Starr's description for 1748 is referred to *supra*, p. 695. Sanderson, *Report*, u. s. p. 263, says of the disease in 1858: "At Launceston the diphtheritic pellicle was tough, leathery, and highly elastic; and on the mucous surface of the fauces and pharynx it attained so great thickness (from one-tenth to one-eighth of an inch) that it was compared by several practitioners to the coriaceous lichens which grow on rotten bark. In the other districts this was never observed."

gangrene or foetor happened amidst the most unwholesome surroundings. The disease was very general in England in 1858. When the deaths from it in 1859 (9587) were tabulated for the first time according to counties, it was found that they came from every part of England and Wales. The highest death-rate was in Lincolnshire, 1·2 per 1000 on the annual average of 1859 and 1860 (995 deaths in the two years). Sussex, Kent, Essex and Norfolk had also high death-rates, the agricultural counties in general having somewhat more than their usual share of an infective mortality as compared with the industrial centres. But it would be erroneous to suppose that diphtheria was at all specially a country disease. The mining districts of Staffordshire, Durham and South Wales had considerable mortalities, and so had Lancashire and the West Riding. But the North Riding and East Riding had their full share or even more than their share; whereas, if it had been scarlatina or enteric fever, they would have been far behind the great industrial division of Yorkshire in ratio of their populations. In the more recent prevalence of diphtheria the country districts have lost their preeminence, according to the following table of death-rates per million living in registration districts classified roughly as sparse, dense and medium[1]:

Diphtheria Death-rates per million, according to density of population.

Period	Dense	Medium	Sparse
1855–60	123	182	248
1861–70	163	164	223
1871–80	114	125	132

In Scotland, also, the incidence was the same: e.g. in 1862, of 997 deaths, 360 were in the towns, 617 in the mainland rural and 20 in the insular districts[2].

The law of incidence of diphtheria upon town and country respectively has become a good deal confused by the extraordinary severity with which diphtheria has fallen in the last two or three years upon most parts of London and upon the

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[1] G. B. Longstaff, M.D., "The Geographical Distribution of Diphtheria in England and Wales," in *Supplement to the 17th Annual Report of Loc. Gov. Board*, 1887–8, p. 135. See also Downes, *Trans. Epid. Soc.* N. S. VII. 193. Farr, *Rep. Reg. Genl.* for 1874, p. 219, gave the following illustration: "It is remarkable that of diphtheria, out of the same number born, more die in the healthy districts of England than in Liverpool; the proportions are 1029 in the healthy districts and 442 in Liverpool of 100.000 born. The deaths from scarlet fever are 2140 in the healthy districts to 3830 in Liverpool."

[2] *8th Detailed Report of the Reg. Gen. Scot.*, p. xxxix.

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adjoining municipal boroughs of Croydon and West Ham. The following table compares the annual death-rates per million in all England and Wales and in London from the year of the first recognition of diphtheria to the present time.

Death-rates from Diphtheria per million, in all England and in London.

Year	England	London
1855	20	—
1856	32	—
1857	82	—
1858	339	—
1859	517	284
1860	261	174
1861	225	239
1862	241	288
1863	315	275
1864	261	207
1865	126	144
1866	140	152
1867	120	145
1868	137	155
1869	47	107
1870	120	104
1871	111	105
1872	93	80
1873	108	95
1874	150	122
1875	142	167
1876	129	109
1877	111	88
1878	140	155
1879	120	155
1880	109	144
1881	121	171
1882	151	220
1883	158	241
1884	185	236
1885	163	221
1886	147	205
1887	157	226
1888	168	305
1889	185	371
1890	179	330
1891	173	340
1892	222	460
1893	302	740

The deaths in London in 1893 were 3196, having been 1962 the year before, but never more than half the latter total in any year previous to 1888. Besides Croydon and West Ham, Cardiff is the great town which has come nearest the London rate, having had 0·68 deaths from diphtheria per 1000 living in 1892, while Swansea had only 0·05, Wolverhampton (including Bilston and Willenhall) only 0·06, Huddersfield 0·03 and Blackburn 0·02. In London the very high death-rate of 1893 was distributed not unequally over all the divisions, the highest mortality corresponding to the highest fecundity.

Diphtheria in London in 1893.

District	Death-rate from all causes	Birth-rate	Diphtheria death-rate
Eastern	25·1	37·3	1·00
Central	26·6	29·0	0·82
Southern	19·9	31·7	0·73
Northern	20·0	29·3	0·73
Western	18·7	26·4	0·52

Diphtheria shows no such decided preference for the late autumnal or early winter season as scarlatina, but the winter is

on the whole its most fatal season, according to the following annual averages of the quarters of the year for twenty years from 1870 to 1889 (total of 67,676 deaths in England and Wales).

Annual average of Diphtheria deaths in the quarters of the year.

1st qr.	2nd qr.	3rd qr.	4th qr.
903	713	730	1025

According to some recent returns under the Notification Act, which are of doubtful value owing to the laxity of diagnosis (greater perhaps in throat-disorders than in any other class of diseases), the second and third quarters of the year have also the lowest mortality in proportion to the number of attacks[1]. As to the ages at which diphtheria proves fatal, they are somewhat similar to those of fatal scarlatina, but slightly higher all over; thus, while two-thirds of the deaths from scarlatina are of infants and children under five years, only one-half of the deaths from diphtheria are under that age. In the first epidemic period, 1855–61, Farr reckoned that 1553 adults had died of diphtheria above the age of twenty-five, while the deaths under that age had been 28,216. In its age-incidence diphtheria is very different from croup, which attacks chiefly children of one, two, and three years of age, the boys dying in greater numbers than the girls[2]. But in all comparisons between diphtheria and croup, as regards sex and age, it should be kept in mind that many cases of angina of the throat, which end in death by extension to the larynx and trachea, are registered as croup, even in epidemics. Diphtheria is the only epidemic disease besides whooping-cough which is more fatal to female children than to males in proportion to the numbers of each sex living. The following annual average death-rates per million for the period 1855–80 show the higher death-rates of females at certain age periods[3]:

	All ages	0–	1–	2–	3–	4–	5–	10–	15–20
Males	157	490	724	617	667	589	325	107	50
Females	168	377	673	668	746	694	413	159	57

It is not until the third year that female children begin to die of diphtheria in excess of males; which means that the

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[1] R. T. Thorne, M.B., *Diphtheria: its Natural History and Prevention.* Milroy Lectures for 1891. London, 1891.

[2] Farr, *Rep. Reg.-Genl.* XXIV. (1861), p. 217.

[3] Longstaff, u. s.

usually greater risk to male infants holds good also in this disease or the two first years, while some difference between the sexes ecomes thereafter so marked as to turn the balance of fatality to the side of the females. Something of the same kind happens in whooping-cough; and it is probable that in both maladies the cause lies in the earlier acquisition by the male of secondary sexual characters in the throat and larynx, as suggested in the chapter on whooping-cough.

Conditions Favouring Diphtheria.

The circumstances of the great and sudden explosion of diphtheria in 1858 and 1859 are as likely as any to throw light on the causes or determining conditions of the disease. Those two years were remarkable for the Thames running so low in summer as to give out a stench, which was thought to forebode much fever[1]. The expected epidemic of fever did not come; on the contrary the fever deaths in London were much lower than usual in 1858 and 1859, and, to judge from the few admissions of each kind to the London Fever Hospital, enteric fever declined as well as typhus[2]. It was diphtheria that came. The lowness of the rivers was due to a succession of years with rainfall below the average:

Low rainfall		High rainfall	
1855	21·1 inches	1865	29·0 inches
1856	22·2 "	1866	30·7 "
1857	21·4 "	1867	28·4 "
1858	17·8 "	1868	25·2 "
1859	25·9 "	1869	24·0 "
Average	21·7 "	Average	27·4 "

The low state of the rivers was an index of a low level of the ground-water. If diphtheria is to be included among the infections that have the habitat of their virus in the soil, it will probably be found to be affected by irregularities in the movements of the subsoil water. A series of observations have been made which seem to favour that hypothesis.

At Maidstone in each of the three years 1885, 1886 and 1887, the ground-water rose with the greatest regularity and steadiness to its highest point

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[1] G. Budd, M.D., "Obs. on Typhoid or Intestinal Fever." *Brit. Med Journ.*, 9 Nov. 1861, p. 485.

[2] *Supra*, pp. 210, 213.

towards the end of the first quarter of the year, and fell with equal steadiness to its lowest point in the autumn. During two of the years there was little diphtheria, and in one of them none. But, in the next two years, 1888 and 1889, "the levels of the ground-water oscillated to and fro with unwonted frequence," having several maxima in 1888, and a somewhat uniform high level all through 1889; and during those two years there was a severe outbreak of diphtheria, as well as an excessive number of deaths registered as "croup[1]."

The relationship with the ground-water, if any, will probably be found to be more than ordinarily complex; but some connexion is indicated by the remarkable selection of the Fen country of Lincolnshire in 1858. Among the 18th century observations, it was remarked in New England in 1735—36 that the throat distemper was worst near lakes or rivers, as at Newbury Falls, Hampton Falls, and the like. The ill-reputed "Kidderminster sore throat," was associated with the low situation of weavers' houses in the valley of the Stour, subject to inundations. Practitioners in many parts of England and Scotland have suspected an association with water, even if it were only a mill dam, in the more recent prevalence of diphtheria[2].

Diphtheria has affinities in its pathological nature with enteric fever on the one hand and with scarlatina on the other. The process in the throat and pharynx is comparable to the typhoid process in the ileum, which is often a truly diphtheritic process in the second half of the fever[3]. The affinities to scarlatina are shown best of all in the real ambiguity of diagnosis in some whole epidemics of the 18th century, if not also in the great epidemics of *garrotillo* in the 16th and 17th centuries. Another singular affinity both to scarlatina and to enteric fever lies in the fact that diphtheria, as well as each of these, has been distributed in milk from some particular dairy, and that contamination of the milk by the products of disease upon the cows' teats has been found to be the relevant thing both for the scarlatina and the diphtheria[4]. Again, whatever suspicion pertains to slaughter-houses or animal offal for the production of a scarlatinal miasm, pertains to them also for the diphtherial. With such more or less real affinities in the pathology and etiology, it may be made a question whether the recent increase of the death-rate by diphtheria in London and some other places has depended, as if in the way of correlation, upon the decrease in the

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[1] Matthew A. Adams, cited by Thorne, u. s. with diagram.

[2] M. W. Taylor, M.D., "Diphtheria in connection with Damp and Mould Fungi." *Trans. Epic. Soc.* N. S. VI. (1886–7), p. 104. Thorne, u. s. gives instances in which diphtheria seemed to choose out wet and impervious soils.

[3] L. Traube, *Gesammelte Beiträge, &c.*, Berlin, 1871, II. 11.

[4] Thorne, u. s. has collected and analysed very fully the instances of diphtherial epidemics traced to cows' milk. It is commonly assumed that the epidemics are either wholly diphtherial or wholly scarlatinal, but not a mixture of the two diseases.

death-rates of scarlatina and of enteric fever[1]. Diphtheria is perhaps the most obscure and complex of all the infective diseases in its causes and favouring conditions. A certain explanation may seem to suit one outbreak and be wholly irrelevant for another. More particularly there have been innumerable cases for which insanitary surroundings cannot be alleged in any ordinary meaning of the term.

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[1] W. N. Thursfield, *Lancet*, 3 Aug. 1878, p. 180, has contended for some such correlation between diphtheria and enteric fever in their respective preferences, at that time, for rural and urban districts.

CHAPTER VIII.

INFANTILE DIARRHOEA, CHOLERA NOSTRAS, AND DYSENTERY.

INFANTILE diarrhoea and the cholera nostras of adults are closely allied in symptoms and pathology, but they are so unlike in their fatality that they are best considered apart. Dysentery is sufficiently distinguished from choleraic disorders even in nosological respects; and except in Ireland, where its history (already given) has been somewhat special, it might have been made the subject of a separate chapter in British epidemiology. But, for the same reason as in the case of influenzas and epidemic agues and of scarlatina and diphtheria, it is necessary in a historical review to include infantile diarrhoea, cholera nostras of adults, and dysentery in one chapter, the reason being, that they are not clearly separated in the earlier records. So little are they separated in the London bills of mortality that the younger Heberden, in his fragment upon 'The Increase and Decrease of Diseases[1],' has understood the name of "griping in the guts," under which enormous totals of deaths are entered in the bills for many years of the earlier period, to mean dysentery alone: having assigned that meaning to the name, and having observed, as everyone must, the very palpable fact that "griping in the guts" steadily declined in the bills from the end of the 17th century until it had almost disappeared from them in his own time, he has elaborately proved from the figures that dysentery was at one time among the most important causes of death in London, that it declined in the most regular way, and at length became all but extinct. This illustration of the increase or decrease of diseases has seemed so apt, the statistical demonstration so complete, that it has become a favourite example of those broad contrasts between

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[1] William Heberden, M.D. junior. *Observations on the Increase and Decrease of Diseases, particularly the Plague.* Lond. 1801.

the public health of past and present times which are not less pleasing in rhetoric than they are on the whole true in fact[1]. But it happens that the particular instance is wholly fallacious and erroneous. It was not dysentery that the article "griping in the guts" meant for the most part, it was infantile diarrhoea; which has not only not ceased in our own time, but is commonly believed to be distinctively a product of the industrial town life of the present age. I shall show that it was one of the most important causes of London mortality from the Restoration onwards, and that although it is still one of the great causes of death in infants, yet that it had weekly mortalities in some of the hot summers of former times which were far higher in ratio of the numbers living than the diarrhoeal death-rates of our own time. So far as concerns dysentery itself, it is indeed now rare in England and Scotland, and not common in Ireland; but the real history of its decrease has been altogether different, both in the period of it and in the extent of it, from what Heberden supposed. There are two reasons for the fallacy and error of that writer: the first, that he overlooked the question of age-incidence in "griping in the guts"; the second, that he failed to observe that enormous annual totals of deaths under that head had been gradually transferred in the bills of the Parish Clerks to the head of "convulsions," until there were only a few of the old name left[2].

Summer Diarrhoea of Infants in London, 17th century.

In the period of twenty-five years which Sydenham's epidemic constitutions cover (1661–1686), the first distinctively choleraic season was the late summer and autumn of 1669. It was the first of a series of such seasons, in one or more of which there occurred dysentery, cholera morbus and bilious colic. In the context of the bilious colic of the years 1670–72, Sydenham

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[1] Among the numerous medical writers who have used it are Macmichael, Watson and Chevers. Among historians Lecky (I. 573) has thought it worthy of mention among the progressive improvements of the 18th century.

[2] Heberden (l. c. p. 42) accounted for the enormous increase of the article "convulsions" in the Bills by the inclusion under that term of most of the deaths originally entered under "chrisomes and infants," which were infants under one month. But the latter had been mostly transferred at an early period while convulsions was still a small total; and even at the worst period of the public health in London, about 1730–40, they would not have accounted for a sixth part of the deaths under convulsions. The probability of the deaths from "griping in the guts" having been transferred to "convulsions" was pointed out in a review of Heberden's essay in the *British Critic* on its appearance, without reasons given such as I adduce in the sequel.

remarks that this was a disease which attacked chiefly the young of a hot and bilious temperament, and was most rife in the summer season[1]. It is in connexion with the smallpox of 1667–69 that he speaks of diarrhoea in infants; in that malady, he says, diarrhoea is as natural to infants as salivation to adults, and he blames the imprudent efforts of nurses to check the diarrhoea for the deaths of "many thousands of infants[2]." This is perhaps all that can be found in Sydenham to show that infants did in fact suffer from diarrhoea, and that it was fatal to them in large numbers. Equally indirect is the testimony of Willis. Speaking of convulsions, he says they occur at two special periods of life,—within one month of birth (the "fits of the mother" of 18th century writers), and during teething; and with reference to the cause he says: "As often as the cause of the convulsive distemper seems to be in the viscera, either worms or sharp humours, stirring up to torments of the belly, are understood to be at fault[3]." It may be thought singular that Sydenham and Willis should not have enlarged upon the infantile age at which the summer diarrhoea of London mostly proved fatal, or that Sydenham should not have elucidated by some comment the enormous weekly totals of deaths by "griping in the guts" in the Parish Clerks' bills during many of the summers and autumns that came within the period of his epidemic constitutions.

It should be kept in mind, however, that it was from the populous liberties and outparishes occupied by the working class,—from Cripplegate, Shoreditch, Spitalfields, Whitechapel, St Olave's, Southwark, Newington and Lambeth,—that the largest totals in the bills came. Sydenham in Pall Mall, Willis in St Martin's Lane, and Morton in Newgate Street, were not likely to see much of the maladies of the poorest class, least of all the infantile part of these; and the fact that their illustrative cases of choleraic disease are mostly of adults should not mean that the age of infancy did not then furnish most of the deaths, as it certainly did in later times.

Whatever may have been the reason of their saying so little of infantile diarrhoea, its great frequency or fatality in London in the end of the 17th century rests upon the explicit testimony of Doctor Walter Harris, in his book on the Acute Diseases of

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[1] *Observ. Med.* IV. cap. 7, § 2.

[2] *Ibid.* III. cap. 2, § 54.

[3] *Pathol. Cerebri.* Pordage's Transl. p. 25.

Infants, written in 1689[1]: "From the middle of July to the middle of September these epidemic gripes of infants are so common (being the annual heat of the season doth entirely exhaust their strength) that more infants, affected with these, do die in one month than in other three that are gentle." It was probably this remarkable fatality of the summer diarrhoea of infants that led Sydenham to say that the cholera morbus of August differed *toto caelo* from the disease with the same symptoms at any other time of the year[2].

The summer of 1669 was excessively hot; it was a season of enormous mortality from fevers in Holland, of a type very difficult to understand, and in New England it was remarkable for fluxes, agues and other fevers. In that summer, as well as in the following, Sydenham lays stress upon the amount of choleraic and dysenteric sickness, without saying that it was specially fatal to children. The following Tables, compiled from the weekly bills of the Parish Clerks for each of the two summers, show the enormous rise of the total deaths in August and September, "griping in the guts" accounting for almost the whole of the increase.

Weekly Mortalities supposed of Infantile Diarrhoea in London.

Summer and Autumn of 1669				Summer and Autumn of 1670			
Week ending	Convulsions	Griping in the guts	All causes	Week ending	Convulsions	Griping in the guts	All causes
June 29	30	42	283	July 5	37	41	318
July 6	49	74	365	12	40	51	320
13	48	105	391	19	43	76	351
20	53	119	389	26	40	77	372
27	36	122	368	Aug. 2	49	113	470
Aug. 3	28	96	340	9	38	160	485
10	22	129	437	16	44	189	555
17	43	173	510	23	47	222	629
24	31	182	482	30	42	250	629
31	42	269	665	Sept. 6	31	253	617
Sept. 7	45	318	707	13	24	239	586
14	34	277	619	20	38	225	575
21	33	231	524	27	27	150	474
28	29	232	570	Oct. 4	16	130	401
Oct. 5	38	185	553	11	13	104	376
12	30	172	518	18	17	78	325
19	25	156	473	25	15	75	336
26	16	146	421	Nov. 1	19	46	283
Nov. 2	14	89	372				

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[1] Walter Harris, M.D., *Tractatus de Morbis Acutis Infantum.* Lond. 1689. Engl. Transl. by Cockburn, 1693, p. 39.

[2] *Obs. Med.* IV. cap. 2, § 7: "haud aliter ac si in aëre peculiaris mensis hujus [Augusti] lateat reconditum ac peculiare quiddam, quod specificam hujus modi alterationem, soli huic morbo adaptatam, vel cruori vel ventriculi fermento valeat imprimere."

These are the characteristic London bills of a hot autumn; they recur sometimes two or three years in succession, and on an average perhaps once or twice in a decennium. Any year with an unusually high total of deaths from all causes is almost certain to show a large part of its excess of deaths in the weekly bills of summer and autumn. The proof that these enormous weekly totals under the head of "griping in the guts" were infantile deaths lies in the fact that they were gradually transferred to "convulsions," as will appear in the tables of future autumnal epidemics showing the transference half made and wholly made. The transference to "convulsions" was almost complete before the year 1728, when the ages at deaths from all causes were first published in the weekly bills. After that year it is obvious that any excessive mortality of the six or eight hot weeks of late summer or autumn corresponds to a great increase of the deaths under two years, which is also the increase of deaths from convulsions. But those were the "convulsions" of a particular season, occupying exactly the place which "griping in the guts" held in the weekly bills of certain years in the earlier period. As most of the deaths from infantile diarrhoea are really from convulsions, it is easy to see the high weekly totals of deaths under that generic name must have been from infantile diarrhoea—when they began to rise in August far above the ordinary level of convulsions to fall to the level again in October. It is by precisely the same reading between the lines that we discover, under the head of "diarrhoea and dysentery" in the modern registration returns, that there is hardly any fatal dysentery, not much fatal diarrhoea of adults, but an enormous fatality from the diarrhoea of infants, especially in summer.

The sickness of the latter half of 1669, and of the years following to 1672, which we know from Sydenham and Morton to have been choleraic and dysenteric, was not special to London. The following abstracts of the burial registers of country parishes,

Deaths in Country Parishes of England.

Years	Registers examined	With excess of burials over baptisms	Baptisms in these	Burials in these
1669	118	33	685	878
1670	119	53	781	1403
1671	121	36	668	1051
1672	121	28	555	741
1673	124	16	365	487

by Short, show an excessive mortality in those years, which would have been in part caused by bowel complaints, as in the general "choleric lasks" of the 16th century.

In the summers of 1671 and 1672 the article of "griping in the guts" continues high in the London bills. It rises again decidedly in the summer of 1675, reaching a maximum of 129 deaths in the week ending 24 August, the deaths from all causes being 460. In the summer of 1676 it almost equals the high mortality of 1669 and 1670, reaching a maximum of 238 deaths in the week ending 22 August, the deaths from all causes being 607. In 1678 and 1679 there were epidemic agues, complicated with choleraic flux and gripes, which undoubtedly affected many adults[1]. The deaths from "griping in the guts" continue high in the summers of 1680 and 1681. But by that time the article "convulsions" had steadily increased in the bills; and in the next great season of bowel complaint, the excessively hot and dry summer of 1684, the high mortality of the season is divided more equally between "griping in the guts" and "convulsions," a sufficient indication of the age-incidence of the former:

London Weekly Mortalities.

1684

Week ending		Griping in the guts	Convulsions	All deaths
July	1	56	98	454
	8	71	92	404
	15	65	79	364
	22	74	89	420
	29	116	84	503
Aug.	5	154	180	720
	12	—	—	—
	19	186	100	609
	26	—	—	—
Sept.	2	171	95	585
	9	144	82	564
	16	103	58	471
	23	91	59	464

The summers and autumns of 1688 and 1689 were again characteristic seasons of infantile diarrhoea. The deaths rose in August and September almost as in 1669 and 1670; but now the article of convulsions has actually more of the mortality of the season assigned to it than the original article of "griping in the guts."

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[1] See the reference to Simpson's essay, *supra*, p. 333.

London Weekly Mortalities.

Summer and Autumn of 1688			
Week ending	Convulsions	Griping in the guts	All causes
July 10	84	28	353
17	94	35	388
24	90	80	491
31	108	86	510
Aug. 7	122	119	557
14	141	136	630
21	130	113	518
28	120	90	483
Sept. 4	109	98	532
11	112	119	547
18	90	102	474
25	102	76	476
Oct. 2	71	65	380
9	67	43	362

Summer and Autumn of 1689			
Week ending	Convulsions	Griping in the guts	All causes
July 16	108	60	486
23	109	65	463
30	121	69	504
Aug. 6	147	102	576
13	121	130	631
20	140	150	662
27	150	190	726
Sept. 3	150	170	733
10	108	156	693
17	110	117	630
24	95	90	558
Oct. 1	104	89	540
9	76	78	486

The following table from the annual bills will serve to show the summers most fatal to infants in London, and at the same time the gradual usurpation of the place of "griping in the guts" by "convulsions."

Annual deaths from Infantile Diarrhoea, etc., in London.

	Griping in the guts	Convulsions
1667	2108	1210
1668	2415	1417
1669	4385	1730
1670	3690	1695
1671	2537	1650
1672	2645	1965
1673	2624	1761
1674	1777	2256
1675	3231	1961
1676	2083	2363
1677	2602	2357
1678	3150	2525
1679	2996	2837
1680	3271	3055
1681	2827	3270
1682	2631	3404
1683	2438	3235
1684	2981	3772
1685	2203	3420
1686	2605	3731
1687	2542	3967
1688	2393	4438
1689	2804	4452
1690	2269	3830
1691	2511	4132
1692	1756	3942
1693	1871	4218
1694	1443	5024
1695	1115	4496
1696	1187	4480
1697	1136	4944
1698	1165	4480
1699	1225	4513
1700	1004	4631
1701	1136	5532
1702	1189	5639
1703	985	5493
1704	1134	5987
1705	1021	6248
1706	948	5961
1707	883	5948
1708	768	5902
1709	812	5892
1710	707	6046
1711	614	5516
1712	575	6156
1713	581	5779
1714	670	7161
1715	589	6818
1716	709	7114
1717	653	7147
1718	801	8055
1719	826	7690
1720	731	6787

Summer Diarrhoea of Infants, 18th century.

The first series of unhealthy summers in the 18th century is from 1717 to 1729 (the summer of 1715 having had also high "convulsions"). In the week ending [illegible] September, 1717, the article of "convulsions" rises to 187, while that of griping in the guts is only 13, the deaths from all causes being 522. For the next two years, the highest mortalities of the autumn were these:

London Weekly Mortalities.

Week ending	Griping in the guts	Convulsions	All deaths	Births
1718				
Aug. 12	34	226	653	355
19	23	239	645	383
26	25	256	693	347
Sept. 2	28	265	668	350
9	27	245	725	388
16	26	221	653	336
23	27	213	639	367
30	24	182	632	361
1719				
Aug. 11	32	215	688	354
18	29	243	670	342
25	28	245	755	371
Sept. 1	27	233	726	362
8	17	229	735	393
15	22	218	728	379
22	14	202	663	360
29	17	161	639	372

If these two tables be compared with the tables already given for the summers and autumns of 1669 and 1670, it will be found that the figures under "griping in the guts" and under "convulsions" have exactly changed places, the hundreds of the former in 1669–70 becoming tens in 1718–19, and the tens of the latter in 1669–70 becoming hundreds in 1718–19.

In those two years the article of fever was very high, contributing largely to the weekly totals of deaths from all causes, especially in the summer and autumn. In 1720 "fever" and "convulsions" again reached a maximum in September, the deaths from all causes in the week ending 20th September being 592. The winter of 1721 (February) is the first of a series when the weekly deaths of the cold season reach the enormous height of the most unwholesome summers, the causes being "fever," "aged," "consumption," "dropsy," and the like, with a due proportion of infantile deaths. The fatal winters following are 1723 (January), 1726 (Jan.—March), 1728 (Feb.—March, the end of a great epidemic of fever), 1729 (Nov.—Dec., still fever), 1732—33 (Dec.—Feb.) and 1738 (November). This was the great period of spirit-drinking, crime, and general demoralization in London.. In the week ending 30th Jan. 1733, the deaths from "dropsy" were 64: it was in the midst of an influenza.

The next characteristic weekly bills of autumn are found in the year 1723, when the following enormous mortalities occurred in three successive weeks:

1723

Week ending	Griping in the guts	Convulsions	All deaths	Births
Sept. 3	23	308	761	396
10	32	251	705	339
17	33	262	768	390

Then comes a succession of four summers and autumns, 1726–29, in which the weekly mortalities are of the same kind—high totals from all causes and high "convulsions," while "fevers" are high in several seasons of the period, perhaps from influenzas. Strother, writing in the summer of 1728, says there was much diarrhoea in London "last autumn [1727] and this summer," the effects of which upon the bills of mortality are nowhere visible except under the enormous weekly totals of "convulsions."

I shall take one more example of a season fatal to infants, the autumn of 1734, by which time we find recorded the ages at death:

London Weekly Mortalities, with the numbers under five years.

1734

Week ending	Convulsions	All deaths under two	Deaths aged two to five	Total of deaths at all ages
Aug. 13	218	240	71	558
20	217	284	76	547
27	240	297	80	573
Sept. 3	260	331	59	638
10	226	283	61	593
17	209	253	43	528
24	169	225	46	515
Oct. 1	158	224	59	510
8	190	236	61	558
15	136	172	42	464

In those nine mortal weeks of 1734, it will be seen that the deaths under two years were about 45 per cent. of the deaths at all ages; they were at the same time considerably more than half the recorded births. That was the characteristic mortality of an unhealthy summer and autumn. It was chiefly caused by the same cholera infantum or summer diarrhoea which raises the weekly bills of London in our own time, and the occasions of it recurred in a series of hot summers, or at intervals, just as they do now. I shall not seek to illustrate this point for the rest of the 18th century, and down to the beginning of registration in

1837. The history of infantile diarrhoea is a continuous and uniform one, with indications of greatest severity in the first half of the 18th century. Sir William Fordyce, whose general theme is what he calls the hectic fever of children (rickets), thus reveals some reasons why that should have been the worst period of infantile diarrhoea[1]:

> "I speak within the bounds of truth when judging from the Bills of Mortality and the numbers in such circumstances who have been brought to my door since the year 1750, I assert that there must be very near 20,000 children in London, and Westminster and the suburbs (if this be questioned, examine the public charity schools and workhouses, the purlieus of St Giles's and Drury Lane, and satisfy yourselves) ill at this moment of the hectic fever, attended with tun-bellies, swelled wrists and ancles, or crooked limbs, owing to the impure air which they breathe, the improper food on which they live, or the improper manner in which their fond parents or nurses rear them up: for they live in hotbed chambers or nurseries, they are fed even on meat before they have got their teeth, and, what is if possible still worse, on biscuits not fermented, or buttered rolls, or tough muffins floated in oiled butter, or calves-feet jellies, or strong broths yet more calculated to load all their powers of digestion; or are totally neglected."

Mistaken regimen among the more comfortable, total neglect among the lowest class—these general causes of infantile mortality reached their highest point in London under George I. and George II., at the time of the disastrous mania for spirit-drinking. But the broken constitutions of the parents were probably a more telling thing for the poor stamina of the children than close nurseries, injudicious food or even total neglect[2].

While the article "Convulsions" in the London bills gradually swallowed up nearly all the deaths of infants under two years, and so far extinguished the article "griping in the guts" that the latter in the year 1739 had fallen to the merely nominal figure of 280 deaths in the year, yet it should be borne in mind that there must have been in the same period an excessive mortality from convulsions not specially related to cholera infantum. For example, the kind of convulsions in new-born infants which nurses called the "nine-day fits," produced the following mortalities in the Lying-in Hospital of Dublin: Of 17,650 infants born alive in the hospital from 8 Dec. 1757 to 31 Dec. 1782, there died 2944 within a fortnight of birth, or 17 per cent. The disease of perhaps nineteen in twenty was "general convulsions, or what our nurses have been long in the habit of calling the nine-day fits[3]." Corresponding deaths in London would have been included under "chrisoms and infants" in the earlier period; but as that article gradually ceased, they were naturally transferred to the article "convulsions."

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[1] W. Fordyce, M.D. *A new inquiry into the Causes, Symptoms and Cure of Putrid and Inflammatory Fevers: with an Appendix on the Hectic Fever and on the Ulcerated and Malignant Sore Throat.* London, 1773, p. 207.

[2] See the Representation of the College of Physicians on Drink in 1726, cited at p. 84.

[3] Joseph Clarke, M.D. "Nine-day Fits in the Lying-in Hospital of Dublin." *Trans. Royal Irish Academy* (in *Med. Facts and Obs.* III. 1792).

The sacrifice of infants' lives in London by the diarrhoea of summer having been so enormous as the preceding tables show, the question arises whether the same disease was a chief factor in the mortality of provincial cities and towns. There is little positive evidence for, and there is a good deal of probability against, its having been so important anywhere as in London. In the second quarter of the 18th century, when London had 700,000 inhabitants, the larger provincial towns such as Edinburgh, Glasgow, Manchester, Newcastle had not more than 30,000 to 40,000. A Liverpool writer in 1784, by which time the population had grown much, does indeed say that young children in large towns during the hot summer months are apt to be fretful and peevish, and that they should have a change to the air of the country[1]. But it is inconceivable that Manchester, with such vital statistics as are shown at p. 644 could have had the same death-rates from convulsions in general or from the summer-diarrhoea kind of them in particular, that London then had. Still it had at least a local predisposition, then as now, to epidemic diarrhoea. Thus Ferriar, having described certain flagrant nuisances in the town, goes on to say that the burning summer of 1794 was followed by wet warm weather, that a bilious colic raged among all ranks of the people, and that thereafter "the usual epidemic fever" became very prevalent among the poor[2].

The bills of mortality for occasional years at Chester, Warrington, Northampton, Carlisle and Edinburgh, which have been cited before in various contexts, throw hardly any light upon this question of infantile diarrhoea. The records of the Newcastle dispensary in the end of the 18th century do show a good many cases of diarrhoea to have been attended, with a proportion of fatalities which suggests that some, at least, were in infants. Newcastle, as will appear in the sequel, was certainly much subject to dysentery and the diarrhoea of adults in the 18th century, and was as likely a place as any in England for cholera infantum. In the records of two towns of Scotland it seems probable that a good deal of infantile diarrhoea had been entered in the burial registers under the name of "bowel-hive."

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[1] Moss, u. s. He makes out that the infants of the poorer class were much neglected by their drunken parents.

[2] John Ferriar, M.D., *Medical Histories and Reflections.* 2 vols. Lond. 1810. II. 213 seq. "On the Prevention of Fevers in Great Towns."

At Kilmarnock, from 1728 to 1764, and at Glasgow from 1783 to 1800, the principal causes of death in infancy had the following annual average ratios per cent. of the deaths from all causes:

	Kilmarnock 1728–64		Glasgow 1783–1800	
Smallpox	16	per cent.	18·8	per cent.
Bowel-hive	7·0	”	6·5	”
Chincough	3·0	”	5·0	”
Closing	2·8	”	2·7	
Measles	2·4	”	[illegible]·3	”
Teething	1·4	”	3·5	”

The article “bowel-hive” has a somewhat higher ratio of the deaths from all causes at Kilmarnock, with about 4000 population, than at Glasgow with some 80,000, and was probably a very comprehensive term[1].

So far as concerns systematic medical description, an article by Dr Benjamin Rush, of Philadelphia, written in 1773, is the first expressly on the theme of cholera infantum or the summer diarrhoea of children; but, as Hirsch correctly remarks, the popular names of the disease then current in American towns, such as “disease of the season,” “summer complaint,” or “April-and-May disease” (Southern States), indicate that it was well known before the profession began to write upon it[2]. So far as concerns London, I am disposed to infer that it was more common, relatively to the population, in the end of the 17th century and throughout the 18th than in our own time. I shall come back to that after giving the modern statistics of the malady for the capital and other English towns.

Modern Statistics of Infantile Diarrhoea.

The first six months of registration of the causes of death in England and Wales, July—December, 1837, brought to light the following highest mortalities from diarrhoea, which are mostly in manufacturing towns, and especially in those of Lancashire and Yorkshire:

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[1] Watt, u. s., says that “bowel-hive” at Glasgow included, along with teething, “a promiscuous mass which may be considered nearly in the same light as the great number of deaths in the London bills of mortality ranked under the terms convulsions, gripes of the guts, &c.... If the patient dies in a state of convulsions, this, we are told, is owing to the hives having gone in about the heart, or their having seized the bowels.”

[2] Hirsch, *Geographical and Historical Pathology*, Engl. Transl. III. 376.

1837

Deaths by Diarrhoea	3rd qr.	4th qr.
Manchester	164	47
Salford	26	15
Chorlton	63	14
Liverpool	142	49
West Derby	53	15
Leeds	52	37
Nottingham	43	4
(besides dysentery	25	2)
Dudley	45	52

Deaths by Diarrhoea	3rd qr.	4th qr.
Wolverhampton	37	32
Bolton	40	27
Newcastle	35	25
Sheffield	30	23
Stockport	28	23
Preston	21	20
Wakefield	22	10
Cockermouth	[illegible]2	14

The returns were incomplete at first; and, for London, the figures of only three parishes are given:

	3rd qr.	4th qr.
Shoreditch	73	15
Greenwich	43	19
Kensington	35	13

Apart from the imperfect machinery of registration in the first years, the figures of mortality by infantile diarrhoea are incorrect owing to many such deaths having been certified as from "convulsions," according to the old tradition of the Parish Clerks' bills. Doubtless this goes on still to a considerable extent; but it will appear from the following comparative table for London that it masked the real amount of infantile diarrhoea to a much greater extent at the beginning of registration than afterwards.

London Mortalities from the beginning of Registration.

Years	Diarrhoea	Dysentery	Cholera	Gastritis and Enteritis	Convulsions
1838	393	105	15	881	3419
1839	376	79	36	843	2961
1840	452	70	60	977	2983
1841	465	78	28	957	2778
1842	704	151	118	996	2773
1843	834	271	85	874	2701
1844	705	125	65	818	2736
1845	841	99	43	707	2395
1846	2152	156	228	648	2086
1847	1976	—	—	—	2258

There is a progressive decline under "convulsions" and a progressive increase under diarrhoea. The year 1846 was undoubtedly marked by an unusual amount of choleraic disease; but the high level of the diarrhoeal deaths was maintained from that year, so that it is probable that some radical change

had been made in the mode of entry. The nearly equal proportion of deaths from diarrhoea and from convulsions in London has continued since that time to the present, the former falling mostly in the third quarter of the year, the latter not unequally on all the quarters.

In all England and Wales during the first five and a half years of registration the deaths from diarrhoea were few compared with the numbers relative to population in later periods:

England and Wales

Years	1837 (6 mo.)	1838	1839	1840	1841	1842
Deaths from Diarrhoea	2755	2482	2562	3469	3240	5241

There is a break in the annual tabulations of the returns for four years from 1843 to 1846; when they are resumed in 1847, the diarrhoeal death-rate per million living is found to have apparently risen to an enormous height, at which it remained somewhat steady for a whole generation.

Annual average Mortalities per million living from Diarrhoea (and Dysentery).

England and Wales		London	
1838–42	254	1838–40	274
1847–50	900	1841–50	782
1851–60	918	1851–60	1030
1861–70	968	1861–70	1040
1871–80	917	1871–80	949
1881–90	662	1881–90	749

From year to year the mortality has fluctuated enormously, as in the following list, the rise or fall depending for the most part on the kind of summer: e.g. that of 1893 was hot, and had an excessive mortality from infantile diarrhoea.

1866	18266	1876	22417	1886	24748
1867	20813	1877	15282	1887	20242
1868	30929	1878	25103	1888	12839
1869	20775	1879	11463	1889	18434
1870	26126	1880	30185	1890	17429
1871	24937	1881	14536	1891	13962
1872	23034	1882	17185	1892	15336
1873	22514	1883	15983	1893	28755
1874	21888	1884	26412		
1875	24729	1885	13398		

These large annual totals stand almost wholly for deaths of infants, according to the following table of rates per million living at the respective ages:

Mortality from Diarrhoeal diseases per million living at the age-periods.

	All ages	0—5	5—10
1851–60	1080	5263	229
1861–70	1076	5985	160
1871–80	935	5728	69

Three-fourths of the deaths are of infants in their first year. The middle period of life is comparatively free from this cause of death, but at fifty-five the ratio begins to rise again, and at seventy-five and upwards is almost as high, among the comparatively small number living in extreme age, as it was in infancy. Male infants die of it in excess of females, according to a very general rule of sex mortality. It is also according to rule that the ratio of female deaths approximates to that of males in middle life and old age.

The deaths from infantile diarrhoea fall in great excess upon the towns, and most of all upon the manufacturing towns and certain seaports. London, which almost certainly had a great pre-eminence in the 18th century in the matter of infantile deaths by summer diarrhoea, has lost it to a number of provincial towns, of which the following is a list in the order of the percentage ratios of their diarrhoeal death-rate per 1000 living under five years to their death-rates from all causes under five years (Decennial Period, 1871–80):

Percentages of Diarrhoeal death-rate in the death-rates from all causes under five years.

Yarmouth	19·4	Wigan	12·7
Leicester	19·2	Hartlepool	12·5
Preston	16	Nottingham	12·4
Worcester	16	Sheffield	12
{Sculcoates	16	Hunslet	12
{Hull	14	Bolton	11·6
Northampton	15	Holbeck	11·6
Coventry	15	Stoke-on-Trent	11·3
Goole	14	Stockport	11·2
Leeds	13·7	Liverpool	11
Birmingham	13·5	Blackburn	10
Manchester	13	London, St Giles's	10
Salford	13	London, Whitechapel	9·6
Norwich	13		

The reasons for placing the towns in the above order will be found in the Table that follows, the significance of which will be pointed out after some other matters have been disposed of. Meanwhile it may be said that all these have diarrhoeal death-

rates under five years greatly in excess of all England and of all London.

Table of English Towns with highest death-rates from Infantile Diarrhoea.

	Death-rate from all causes under five per 1000 living at the age-period	Death-rate from diarrhoea under five per 1000 living at the age-period	Deaths of infants under one to 1000 births	Birth-rate per 1000	Death-rate per 1000
Liverpool	119·29	14·13	217	35·08	33·57
Manchester (1871–73 incl. Prestwick)	103·82	18·84	207	38·97	31·46
Manchester (1874–80)	103·52	11·23	190	40·78	32·16
Preston	97·85	15·61	212	37·86	28·05
Salford	95·96	12·44	184	42·39	27·65
London, Whitechapel	95·83	9·24	181	36·42	33·03
Holbeck	94·[illegible]0	10·93	196	42·63	26·64
London, St Giles's	9[illegible]·[illegible]9	9·42	176	34·05	23·42
Leicester	9[illegible]·[illegible]2	17·81	214	41·44	24·46
Sheffield	91·22	10·96	183	42·50	27·41
Blackburn	90·33	9·02	191	39·30	25·29
Hunslet	88·35	10·75	192	44·52	25·49
Leeds	87·47	12·02	188	39·33	26·04
Wigan	87·28	11·13	172	45·70	25·77
Stoke-on-Trent	86·76	9·91	189	43·29	25·80
Birmingham	86·10	11·78	179	39·89	25·82
Stockport	80·33	9·05	182	35·[illegible]	24·73
Nottingham	79·30	9·86	184	32·50	[illegible]·55
Bolton	78·54	9·13	167	39·20	24·34
Yarmouth	75·37	14·38	199	32·45	22·94
Hartlepool	75·26	9·43	166	43·36	22·49
Hull	77·89	11·02	178	37·88	24·52
Sculcoates	71·53	11·64	170	39·46	21·66
Norwich	72·29	9·78	188	32·86	23·32
Northampton	71·41	10·85	173	37·48	22·65
Worcester	68·24	11·10	176	32·00	22·13
Coventry	68·09	10·06	164	35·17	21·59
Goole	64·58	9·20	166	36·47	21·39

The deaths by infantile diarrhoea have a seasonal rise more marked than that of any other malady. In the curves formed by Buchan and Mitchell of the rise and fall of the deaths by various diseases in London throughout the year, that of diarrhoea was the sharpest, rising to a high peak in the third quarter of the year (July—Sept.). "Speaking generally," says Dr Ogle, "it appears from the returns of mortality in London that the diarrhoeal mortality becomes high when the mean weekly temperature rises to about 63° F.[1]" The season is practically the same

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[1] Supplement to the 45th Annual Report of the Registrar-General. London, 1885, p. xiii. Ballard, following the method of Pfeiffer (1871) for Asiatic cholera, has shown that the correspondence is closest with the temperature of the ground four feet deep.

throughout the British Isles. But in warmer countries, such as the more southern of the United States of America, infantile diarrhoea is "the April and May disease." It is not the fatalities only, but the cases as a whole, that fall decidedly upon the third quarter of the year[1].

Causes of the high death-rates from Infantile Diarrhoea.

Sydenham said that the diarrhoea or bilious colic of London in the month of August differed *toto coelo* from that of other seasons of the year; and Harris, writing in the year of Sydenham's death (1689), said that more infants, affected with the epidemic gripes, died in one month of the hot season, from mid-July to mid-September, than in other three that are gentle. If this were taken to mean that the infantile mortality from all causes was trebled by the prevalence of diarrhoea during the eight warmest weeks of the year, it would be nearly borne out by the weekly bills of mortality, according to the examples given of them from the more fatal years. So far from the deaths of infants in London by summer diarrhoea having increased in the present century, they would appear to have diminished greatly. The two worst weeks of an unhealthy summer or autumn raised the London deaths in former times relatively as much as the whole diarrhoeal season would do now. If this great change for the better be admitted as correct, it may throw some light upon the causes of excessive infantile diarrhoeal mortality in London in former times, and in some other English towns at the present time.

The London populace in the 17th and 18th centuries were not only the single great urban community in the kingdom, but they were far more "urban" than now, in Milton's sense of being

> "long in populous city pent,
> Where houses thick and sewers annoy the air."

The houses stood closer together, many of them back to back in courts and alleys. The streets were narrower. The inhabited area had few or no open spaces besides the bed of the Thames. Not only the City and Liberties, but also the out-parishes were

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[1] Ballard, *Report to the Local Government Board upon the Causation of Summer Diarrhoea*, 1889, p. 32.

compact, as if within a ring fence, joining on to the open country abruptly, and not as now in straggling suburbs. It was hardly possible to take children out for an airing, except in the west end. When Lettsom about 1770 applied the fresh-air treatment to convalescent cases of typhus, he had to send the patients to loiter on the bridges spanning the Thames. As Cobbett said, London was a "great wen," in the correct sense of a shut sac which grew by distension. The soil was full of organic impurities, including the decompositions of many generations of the dead. A hot summer in former times raised effluvia from the ground such as the modern residents have no experience of. The life indoors was equally adverse to infants. Fustiness was favoured by the window-tax; a tenement-house was apt to be pervaded by the excremental effluvia from the "vault" at the bottom of the stair. The worst time of all in London was the great drunken period from about 1720 onwards. Doubtless drink was then used, as it is sometimes now, to drug the fretful infants into torpor; but it told also upon them indirectly, inasmuch as dissolute parents would have bred children with *mala stamina vitae*[1]. In all these respects there has been so great an improvement in London that, although its population now exceeds four millions, its death-rate from infantile diarrhoea, a distinctively urban disease, exceeds only by a little the mean of all England and Wales.

While the mortality from infantile diarrhoea in London has undoubtedly decreased since the 17th and 18th centuries per head of the population, it is equally certain that there has been within the present century a great relative increase of the deaths from that cause in the country generally. The reason is that there has been an enormous increase of population and that the increase has been almost wholly urban. The rise of new manufacturing towns, with the great extension of the borders of old towns, as in Lancashire and Yorkshire, has inevitably brought to the front this distinctive fatality of town-bred infants. If the additional millions had been dispersed in village communities over the face of the country, as in Bengal, the mere density of population per square mile would have had its effect on the

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[1] Willis mentions an instance (*Pathol. Cerebri*, Pordage's transl. p. 25) which can hardly mean anything but congenital feebleness as a cause of infantile convulsions. A neighbour of his (in St Martin's Lane) had lost all his children by convulsions within the space of three months. Another child was born, and Willis was sent for to advise what regimen should be followed so as to save it from the same fate.

public health, but not the same effect. There are now two or three provincial cities comparable in size to 18th century London, and there are some twenty more large enough to be in the same group. In most of these the mortality from infantile diarrhoea has held its ground, for all the improvements in sanitation and in well-being whereby the death-rate from all causes has been considerably reduced. It is mainly owing to that disease, and to whooping-cough, that the death-rate the first year of life, although it has ranged widely from year to year, has fallen but little in the successive decennial periods. The bad eminence of some towns in the list already given is probably due to a composition of causes, among which the situation, soil, depth of ground-water, and the like, would count. It is remarkable, however, that there are only a few of them, such as Liverpool and Hull, that have been the chosen seats of great epidemics of Asiatic cholera. On the other hand, Leicester and Birmingham never had an epidemic of that disease, while Preston and the cotton-weaving towns of Lancashire generally have had but slight outbreaks of it. Again, the deaths from diarrhoea have been more purely infantile in the group of towns which have had little or no Asiatic cholera[1].

That which distinguishes the Lancashire and West Riding towns with highest proportions of diarrhoeal death-rates in their infantile death-rates generally, as well as such towns as Leicester, Worcester, Northampton, Coventry and Norwich, Birmingham, Nottingham and Stoke-on-Trent, is the extensive employment of women in factory work and other labour of the factory kind. The Census returns do not adequately show this for married women, who may be returned simply as of the married rank whether they be wage-earners or not; but it is well known that the female labour of industrial towns is to a large extent the labour of child-bearing women. Among the towns that stand highest for infantile diarrhoea, Preston, in the Census of 1881, had 32 per cent. of its adult female population occupied in the cotton mills; Leicester had 20 per cent. of all its women occupied in

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[1] This is clearly seen in comparing ages at death in Liverpool, and in Preston or Salford. Again in the ten years 1871–80, there were 4530 deaths from diarrhoea in the group of shipping towns, Yarmouth, Hull (with Sculcoates), Goole and Hartlepool, of which 70 per cent. were under one year, 19 per cent. from one to five, and 11 per cent. above five, chiefly in old age. In the group of Leicester, Worcester, Northampton and Coventry in the same period, there were 5001 deaths, of which 74 per cent. were under one year, 17 per cent. from one to five, and 9 per cent. above five, chiefly in old age.

various industries, of which the chief are the hosiery and boot-making; Northampton only 13 per cent., all at boot-making; Worcester, a percentage, unknown for the city, occupied mostly at glove-making; Norwich about 10 per cent. of its women returned as employed at boot-making, silk manufacture, and various smaller industries.

One obvious result of married women engaging in factory labour, or piece labour of the same kind at home, is that they do not suckle their infants; and it has long been known that infants brought up with milk from a feeding-bottle are much more liable to diarrhoea than infants brought up at the breast. But the feeding-bottle is now too universal an appurtenance of infancy among all classes and in all places to be a sufficient explanation without something else, although there is no doubt that feeding-bottles which are not kept very carefully clean are a real danger in the particular way. Again, young children above the age for suckling or feeding by the bottle are attacked by summer diarrhoea in about the same proportions (e.g. at Leicester) as infants under one year, although they do not contribute an equal quota to the death-roll.

In the discussions upon this question it has been commonly assumed that the fault lies with the mother after the birth of her child, and all the remedial measures, such as crèches for the infants of workwomen, have that assumption underlying them[1]. I believe that this is a very inadequate account of the cause of this great modern evil, and that the remedies proposed are mere palliatives which are destined to fail. The importance of the matter may justify me for once in making an excursus into physiology and pathology.

The problem of infantile diarrhoea is in great part the same as the problem of rickets. The peculiar summer disease of town-bred infants is especially apt to assail the rickety: probably a very large number of the

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[1] Ballard, *Report, &c.* u. s. says that "occupation of females from home," which had been often assigned by medical officers of health and others as a fruitful cause of infantile fatal diarrhoea, "resolves itself mainly into the question of maternal neglect, with the substitution more or less of artificial feeding for feeding at the breast." Tatham, *Brit. Med. Journ.* 1892, II. 277, is of opinion that the rate of infant mortality was considerably increased by the practice, which obtained in most manufacturing towns, of allowing women to return to work within a week or ten days after their confinement, so that the duties of the mother were necessarily delegated. The paper by Dr G. Reid, *ibid.* p. 275, which called forth that and similar opinions as to the kind of maternal neglect that favoured the mortality by infantile diarrhoea, bore the title, "Legal restraint upon the employment of women in factories before and after childbirth"; but the emphasis falls almost wholly upon restraint of the mother's industrial occupation after the child is born.

infants under one who are cut off by it would have become obviously rickety if they had lived a few months longer. But even if there were not this well-known correspondence between the subjects of infantile diarrhoea and of rickets, we should find analogies in the pathology of each. Rickets is an exquisitely congenital disease, or a disease acquired by the child in the womb from the kind of intra-uterine nutrition that it receives. In recent times it has been usual to restrict the term congenital in rickets to the very few cases that have rickets developed at birth. This is a typical instance of the peculiar narrowness of view in modern pathology. All rickets is congenital, although it is rare to find the symptoms made manifest until the infant is nearly a year old. Cullen's reasoning on this point a century ago has never been answered nor superseded. The theories of that day to explain rickets by injudicious feeding or regimen after birth seemed to him beside the mark: "Upon the whole I am of opinion that hired nurses seldom occasion this disease unless when a predisposition to it has proceeded from the parents....I am very much persuaded that the circumstances in the rearing of children have less effect in producing rickets than has been imagined....I doubt if any of the former [dietetic errors and the like] would produce it where there was no predisposition in the child's original constitution....So far as I can refer the disease of the children to the state of the parents, it has appeared to me most commonly to arise from some weakness, and pretty frequently from a scrofulous habit, in the mother," (Cullen, *First Lines*, Part III. Bk. II. chapter 4). The chief exponent of the diathetic views on rickets in our time has been Sir William Jenner (*Med. Times and Gaz.*, 1860, I. 466); but I remember at the Pathological Society on 7 Dec., 1880, how unacceptable, or perhaps unintelligible, that part of his exposition was to a younger generation who appeared to have forgotten the meaning of *mala stamina vitae*.

The congenital nature of rickets is not only an empirical fact, based upon experience, but it is a doctrine of rational pathology. The latter aspect of it rests upon the correct physiology of intra-uterine nutrition, for which I refer to my investigations on the structure and function of the placenta (*Journal of Anatomy and Physiology*, July, 1878, and January, 1879). The detailed application of the physiological facts to rickets I have attempted deductively in section 5 of the article "Pathology" in the *Encyclopaedia Britannica*, vol. XVIII., 1884. The building up of the placenta by the mother, and the due performance of function by that great and wonderful extemporised organ, require certain favouring conditions, which have been never unperceived by the common sense of mankind. Those conditions are certainly not to be found in factory labour. A woman who has to be thinking of the time-keeper at the gate and the foreman in the mill, who has ever in her ears the din of belts and wheels and mill-stones, who has dust in her lungs and weariness in her back, can hardly do justice to the child in her womb. The rearing of the child after it is born is of small consequence beside the rearing of it before it is born. The opportunity comes once (heredity apart) of giving it good stamina or bad; and in the circumstances of factory labour the wonder is that breeding women provide so well as they do for their unborn offspring. It is undoubted that they often tax themselves beyond measure to do so, in tacit obedience to the great law of maternity.

While the connexion of rickets in the child with the laborious or anxious preoccupations of the mother during gestation can be followed out in physiological or pathological detail, the connexion with the same of a disposition to summer diarrhoea remains empirical, except in so far as it is a part of the rickety constitution itself. Some congenital weakness, we may suppose,

attends the functions of digestion and assimilation, and, under the relaxing influence of continued high temperature, leads to vomiting and purging, to which many infants succumb through the eventual implication of the cerebral functions.

Ballard gives a table to show that of 332 infants (in a total of 340) who died of diarrhoea at Leicester in 1881 and 1882, 141, or 42·5 per cent. were "healthy," and 191, or 57·5 per cent. were "weakly," and other tables to show that "our experience of these Leicester epidemics by no means supports an opinion commonly held that a summer diarrhoeal epidemic makes its first fatal swoop upon the weakliest children[1]." If "weakly" and "healthy" were as determinate as bushels of wheat or barley there would be some fitness in this resort to numerical precision. But, in the circumstances, common experience will come as near the truth as the statistical method can, and will assign poor stamina to a much larger proportion of the infants that die. The poor stamina may be more a matter of inference than of direct observation. Thus, the last case of a death from infantile summer diarrhoea that came under my notice was in a big-boned and well-grown infant in the country. But it was the twelfth child of an equally large-built country woman, then big with her thirteenth, whose husband, a farm labourer, earned on an average not more than ten shillings a week. The rate of fecundity has, of course, a direct influence upon the stamina of the children. Its bearing upon the death-rate from infantile diarrhoea is shown in one of the columns of the table at p. 762.

Cholera Nostras.

Thus far I have considered diarrhoea as the "disease of the season" for the age of infancy or early childhood; and undoubtedly the large totals of deaths from it in the London bills, whether under the name of "griping in the guts" or afterwards under the generic name of "convulsions" were nearly all infantile deaths, both in earlier and later times. If we had regard only to the statistics of mortality and the effects upon population, we might now pass from the subject of epidemic diarrhoea, having said all that has to be said of it in those respects. But the deaths from epidemic diarrhoea, mostly of the summer and autumn, are far from being a correct measure of its prevalence, whether in our own time or in earlier times. Adults suffered from it in a fair proportion of the numbers living at the higher ages, although few of them died of it, except among the elderly and aged. It is only for modern times that we have any figures of the number of persons attacked at the respective periods of life; and these I shall take first in order, as illustrating the probabilities or generalities that may be collected from earlier writers such as Willis and Sydenham.

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[1] L. c. pp. 43-45.

The following Table of the ages attacked at Leicester during a recent series of years shows a smaller proportion of attacks in infancy than some other modern tables do; but it is not misleading for general experience, and it will serve emphatically to correct the illusion that infants, because they contribute the bulk of the deaths, are most obnoxious to the attacks[1]:

44,678 *cases of Summer Diarrhoea at Leicester in seven epidemic seasons*, 1881–87.

Age	Cases	Per cer
Under one year	2,284	5·2
One year and under five	8,956	20·0
Five years and upwards	33,438	74·8
	44,678	100·0

On the other hand, the fatalities from diarrhoea in all England during the same seven years had the following very different incidence upon the periods of life:

	Under one year	One year and under five	Five years and upwards
1881	9408	2476	2852 = 19·3 per cent.
1882	10680	3555	3050 = 17·6 "
1883	9962	2843	3128 = 19·6 "
1884	17854	4794	3764 = 14·2 "
1885	8821	2023	2524 = 17·9 "
1886	16514	4936	3298 = 13·3 "
1887	14101	2936	3205 = 15·8 "
	Annual average per cent. above five		16·8

Thus, while (at Leicester) the attacks above the age of five years were 74·8 per cent. the fatalities above that age (in all England) were only 16·8 per cent. and the greater part of the deaths in that small fraction were of elderly or aged persons. This means that persons attacked by diarrhoea between the ages of five and (say) fifty nearly all recover; on the other hand a large proportion of infants in their first year succumb to the attack, and a considerable proportion of elderly or aged persons succumb to it.

If we were to judge from the direct testimony of Sydenham and Willis, we should say that the cholera nostras of London in the 17th century was chiefly a malady of the higher ages; there is little in their writings to suggest the enormous mortality of infants from that cause, which can be deduced from a close

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[1] Ballard, u. s. Table VI.

study of the bills. One reason for this, as already said, was that the ailments of infants and young children in former times came little under the notice of physicians, being left to the "mulierculae" or nurses, and that among the working class, from which most of the deaths in the bills came, there was in those times an almost total lack of the medical experiences now gained through dispensaries, hospitals and other charities or public institutions. With this proviso we may take the accounts of the older writers as giving a correct picture of the epidemic cholera nostras of a hot and close summer or autumn in former times.

The great seasons of choleraic disease in the 16th century were the years 1539–40, (which were remarkable all over Europe for dysentery as well), 1557–58, 1580–82, and probably 1596[1]. The term commonly used in that period was a choleric lask, which meant *profluvium*. In some, if not in all, of those seasons there was unusual heat and drought. It is clear that these were only the years when cholera nostras of the summer season was exceptionally common and severe. According to a medical work of the year 1610, dealing with the indications for the use of tobacco by individuals, including the seasons of the year when it was most admissible, midsummer is characterized in general terms, and perhaps in the stock language of foreign medical treatises, as the season for "continuall and burning fevers, bleareyedness, tertian agues, vomiting of yellow choler, cholericke fluxes of the belly, paines of the eares and ulcerations of the mouth, putrefactions of the lower parts: especially when the summer, besides his heat, is enclined to overmuch moisture, and that no windes blow, and the weather bee darke, foule, close and rainie....So that in this season, and for these remembered griefes, no man, I trust, will grant tobacco to be verie holesome[2]." Consistently with this Sydenham says that, while the cholera morbus of August, 1669, was more general than he had ever known it, yet in every year, at the end of summer and beginning of autumn, there was some of it; and he compares its regularity to the coming of the swallow in spring or of the cuckoo in early summer. It was marked by enormous vomiting, purging, vehement pain in the bowels, inflation and distension, cardialgia,

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[1] See former volume, p. 412.

[2] *The Triall of Tabacco, &c.* by E. G. [Edmund Gardiner], Gent. and Practicioner in Physicke. London, 1610, fol. 11.

thirst, a quick pulse, sometimes small and unequal, heat and anxiety, nausea, sweats, spasms of the arms and legs, faintings, coldness of the extremities, and other symptoms, alarming to the attendants and sometimes causing death within twenty-four hours[1]. Next year, 1670, in the corresponding season, he describes under the name of a bilious colic, a prevalent malady which, he says, should count rather among chronic diseases[2]. It was marked by intolerable pain, the abdomen being now bound as if in a tight bandage, now bored through as by a gimlet. These pains would remit for a time, and the paroxysm come back, the patient shrinking from the mere idea of it with misery expressed in his face and voice. This was evidently somewhat different from the cholera morbus of the summer of 1669; it was apt to end in inverted peristaltic action, with vomiting of the matters of enemata, or in iliac passion[3]. There was also dysentery in both years, as we shall see.

Morton gives the first choleraic and dysenteric season under the year 1666, and says of its recurrence in the following autumn, that hardly any other disease was to be seen, that the whole town was seized, and that 300, 400 or 500 died of it in a week. This is obviously antedated by two years, just as Morton is two years earlier than Sydenham with the great fatality of measles (1672 instead of 1674). Willis, again, who wrote some twenty years nearer to the events than Morton did, places the great choleraic seasons in 1670 and 1671, instead of 1669 and 1670. Sydenham's dates are undoubtedly correct, both as borne out by the bills of mortality, and as occurring in consecutive order in the annals which he kept for a period of twenty-

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[1] *Obs. Med.* IV. cap. 2.

[2] *Ibid.* IV. cap. 7.

[3] Dr Andrew Wilson, a pupil of the Edinburgh School in the great period of the first Monro, Whytt and Rutherford, used his Newcastle experiences in 1758 and following years as the basis of two excellent essays, one on Dysentery (1761) and the other upon Autumnal Disorders of the Bowels (1765). In the latter he includes both cholera nostras and bilious colic, (as well as dry colic) as Sydenham had done, and makes the following distinction between the two forms, which "are very nearly allied in their nature":—"The vomiting of bile in the cholera is not so early as it is in the other; neither is it so constant, nor in so large quantities. Though a purging generally attends the bilious colic, yet it does not correspond so regularly as it does in the cholera, in which there generally is a call to stool soon after every paroxysm of vomiting...The bilious colic is not generally so quickly hazardous as the cholera is. The intervals between the sick fits are often longer, and when it is attended with danger, it does not become so so suddenly as the cholera does." Bilious colic was not so strictly an autumnal complaint as cholera. It was not so soon relieved by medicines. It resembled cholera in the remarkable character of exciting cramps in other muscles than the abdominal.

five years. The correctness of his dates apart, Willis may be cited for the symptoms of the London cholera[1].

> The onset was sudden, with vomiting and watery purging, accompanied by prostration : "I knew a great many that, though the day before they were well enough and very hearty, yet within twelve hours were so miserably cast down by the tyranny of this disease that they seemed ready to expire, in that their pulse was weak and slender, a cold sweat came upon them and their breath was short and gasping ; and indeed many of them, that wanted either fit remedies or the help of physicians, died quickly of it. This distemper raged for a whole month, but began to decrease about the middle of October, and before the first of November was almost quite gone." The vomitings and purgings were copious, watery, almost limpid, not bilious. The sickness was peculiar to London or the country within three miles of it. It did not seem to be infectious, but to attack only those predisposed to it ; for it would seize those who kept out of the way of the sick and spare those who attended them. Morton, however, declares that he was affected in two successive seasons, "dum, mense Augusto, sedes dysentericorum minus cauté inspicerem."

These illustrations from the highly choleraic summers of 1669 and 1670 will serve to show the prevalence of cholera nostras among adults in London in former times. Its great seasons were the same as those of cholera infantum, of which numerous instances have been given from the London weekly bills of mortality. The years 1727–29 were specially noted for cholera by the annalists, such as Wintringham, of York. Hillary, of Ripon, having entered in his annals a "cholera morbus" in 1731, adds: "which disease I have observed to appear almost every year towards the latter end of summer[2]." A letter from Darlington, 29 July, 1751, having mentioned the death of the earl of Derby by "the cholera morbus," adds that the disease usually rages at the close of summer and towards the beginning of autumn[3]. Newcastle was much subject to it, as well as to dysentery, Wilson, of that town, devoting an essay to dysentery in 1761 and to cholera in 1765. Lind, who went to Haslar Hospital in the very unwholesome period about 1756–58, found much aguish and choleraic sickness: "Obstinate agues, and what is called the bilious cholic, from being accompanied with vomitings and a purging of supposed bile, but especially the flux, are often at Portsmouth and Gosport in the autumnal season highly epidemical. Since I resided here, I have observed those distempers to rage among the inhabitants, strangers and troops with an uncommon degree of mortality ; while, during

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[1] *Pharmaceutice rationalis.*

[2] Appendix to *Essay on Smallpox*, 1740.

[3] *Gent. Magaz.*, Sept. 1751, p. 398.

this period of universal distress at land, ten thousand men in the ships at Spithead remained unaffected with them[1]." At Manchester, in the burning summer of 1794, a bilious colic, says Ferriar, "raged among all ranks of people[2]." Clarke, of Nottingham, writing in 1807 of the great prevalence of cholera nostras, calls it "the usual attendant on autumn[3]."

The appearance of Asiatic cholera in England in the end of 1831 gave rise to much controversial writing for a few months, as to whether the epidemic were really the foreign pestilence. Every effort was made by a certain school to find native precedents for a disease equally malignant; which, if they did not prove the point in question, gave more exact particulars of cholera nostras than we might otherwise have received. The only one of these accounts that need concern us here is Thackrah's for Leeds and its vicinity in 1825[4].

The weather had been exceptional. In May, three-eighths more rain fell than usual, the wind being in the east the whole month. June was showery and sultry, the thermometer on the 12th marking 87°. July was sultry, with drought for several weeks to the 3rd of August, when showers fell. There had been a few cases of cholera in May, June and July, but it was not until August that the disease became rife in Leeds and still more in certain villages near it. The symptoms were purging, vomiting, cramps, prostration, coldness of the extremities, shrinking of the features, &c. At Moor Allerton, a parish three or four miles north of Leeds, with a poor scattered population occupied on the farms, there were found in 60 houses, containing 299 persons, no fewer than 114 cases of sickness in July, August and September, 81 of these from cholera, with 3 deaths. Dysentery was common, both as a sequel of the cholera and as a primary malady. At Halton, three or four miles east of Leeds, with a population better off than in the former, there were found in 60 houses, with 298 persons, 74 cases of sickness, of which 63 were choleraic. At Grawthorpe, four miles west of Wakefield, with a weaving population not poor but of filthy habits, there had been for two months before the visit of inspection more sickness than any one remembered. Twenty of all ages had died of the epidemic, there having been 7 corpses in the village on one morning. Of 70 houses inspected, only 7 had been exempt from cholera and dysentery. In one house of 9 persons 7 were ill, 2 with cholera, others with dysentery and typhus. This was one of the most unhealthy villages, supplied with water from ponds only. In Leeds the choleraic epidemic was less than in the adjoining country, and the few deaths that occurred from it were all among the poor and debilitated. The hot summer of 1825 was unusual for the amount of cholera nostras. It prevailed at South Shields that season with unusual severity, the cramps and spasms being peculiarly manifest[5].

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[1] *Two Papers on Fever and Infection*, 1763, p. 35.

[2] *Med. Hist. and Reflect.* II. 220.

[3] *Ed. Med. Surg. Journ.*, 1807.

[4] Charles Turner Thackrah, *Cholera, its character and treatment, with remarks on the identity of the Indian and English.* Leeds, 1832, p. 24.

[5] W. Horsley, *Med. Phys. Journ.* 24 March, 1832, p. 270.

Dysentery in the 17th and 18th centuries.

The younger Heberden remarks, "There is scarcely any fact to be collected from the bills of mortality more worthy the attention of physicians than the gradual decline of dysentery." I have shown the fallacy of Heberden's proof in the first part of this chapter on Infantile Diarrhoea. It is true that dysentery did decline in London, but not on the evidence adduced by Heberden, nor within the noteworthy limits that he supposed. It was at no time one of the greater causes of death in London, and it had already by the middle of the 18th century reached as low a point as it stood at when Heberden wrote. As it is one of the diseases that have become rare in this country, there is a scientific interest in establishing the fact of its decrease, even although its prevalence had been at no time more than occasional.

Hirsch groups the outbreaks of dysentery as of four degrees of extent: (1) localized in a single town or village, or even a single house, or barrack, or prison, or ship; (2) dispersed over a few neighbouring localities; (3) dispersed over a large tract of country in the same season; (4) simultaneous in many countries, or extending over a great part of the globe, and continuing as a pandemic for several years[1]. The last are the most curious; and of these there are at least two in which Britain had a share, the dysenteries of 1539–40 and of 1780–85. Of the next degree, there have been several in Ireland and Scotland, including those of the great Irish famines of the 18th and 19th centuries, and the "wame-ill" of Scotland in 1439. Of the two minor degrees of extent, there have been, of course, many instances in the towns, counties or provinces of Britain.

A considerable decline of dysentery in London before the end of the 17th century is made probable by various facts that can be gathered from the bills of mortality. When these began to be printed in 1629, dysentery appeared in them under the unambiguous name of bloody flux; there were 449 deaths from that cause in 1629, they had decreased to 165 in 1669 (a year remarkable for dysentery and other forms of bowel-complaint), and to 20 in the year 1690, soon after which the article of bloody flux ceased in the bills. But we are not to judge of the amount

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[1] *Geogr. and Histor. Path.* Engl. transl. III. 315.

of dysentery from the entries under the name of bloody flux alone. In 1650 there began the article of "griping in the guts"; as I have shown, it was mostly infantile diarrhoea of the summer and autumn, but, so long as it lasted, it had probably included some dysentery. Besides the articles of bloody flux and griping in the guts, there was a third article for a time in the bills, namely "surfeit," a term which came at length to mean dysentery[1]. Thus the great plague of 1625 is said to have been preceded by a surfeit in Whitechapel; and it is clear from other uses of that word, for example as applied to slaves shipped on the West Coast of Africa for transport to the West Indies, that it meant dysentery more than any other form of bowel-complaint[2]. Accordingly when we find in the weekly bills of mortality for London that a series of weeks in the dysenteric summer and autumn of 1669 had deaths from "surfeit" to the numbers of 9, 11, 10, 12, 9, 15, &c., we may take it that these were dysenteric rather than choleraic, the more so as the other name "bloody flux" has fewer deaths to it than we might have expected from Sydenham's general language. These various items in the London bills cannot be used for an exact statistical purpose, but only as indications. Perhaps the most trustworthy indication is the total of 449 deaths from bloody flux in the year 1629, being a twentieth part of the mortality from all causes (8771 deaths). That was a prevalence of fatal dysentery in London far in excess of anything that is known in the 18th century, for example in the dysenteric seasons of 1762 and 1781. So long as plague lasted, dysentery seems to have been somewhat common, and probably most so in the plague years; for, besides the surfeit in Whitechapel with which the plague of 1625 is said to have begun, we find many deaths from bloody flux in the year of the Great Plague itself, 1665. As Sydenham and Willis have left good accounts of the London dysentery of 1669–72, it will be convenient to take from these sources our impressions of the disease in the 17th century.

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[1] It is probable that the association of surfeit with bowel-complaint in general and at length with dysentery in particular came from the popular belief that these maladies of the autumnal season were due to repletion with fruit. That was the popular belief from an early period, which nearly all the medical writers on autumnal diarrhoea and dysentery took occasion to combat as either inadequate or erroneous.

[2] See Vol. I. of this History, p. 626. The following is in a letter from Charles Bertie to Viscountess Campden, London, 22 Nov. 1681: "I have safely received your choice present of four bottles, three of Plague and the other of Surfeit water, which I shall preserve against the occasion, being confident that better are not made with hands." *Cal. Belvoir MSS.* (Hist. MSS. Com.) II. 60.

Referring to the dysentery of 1669, Sydenham says that there had been comparatively little of it for ten years before, not including, doubtless, the plague-year of 1665, when Sydenham was out of town[1]. Both he and Willis are clear that there was a certain amount of it every year, although it was seldom fatal in ordinary seasons. The ordinary London dysentery, says Willis, though it be horrid or dreadful by reason of its bloody stools, and is most commonly of a long continuance, yet it is not very contagious nor often mortal[2]. Sydenham says that it was fatal more particularly to aged persons, but highly benign to children, who might be subject to it for months *sine quovis incommodo*. However, in certain seasons it became malignant and caused a good many deaths.

> It began usually with chills and shiverings, to which succeeded heat of the whole body, and shortly after tormina with dejections; but sometimes the griping and stools were the first symptoms. Always there was intense suffering and "depression of the intestines," with frequent straining at stool. The stools were mucous, not stercoraceous, and with traces of blood. The tongue might be whitish, or dry and black; the strength was prostrated and the spirits faint. After a time the streaks of blood in the motions would be replaced by pure blood, without even mucus, a change which threatened a fatal end. Sometimes the bowel became gangrenous while aphthae would appear in the mouth and fauces. If the patient were about to recover, the symptoms would gradually be restricted to the rectum, in the form of tenesmus. Willis says that the dysentery of the autumn of 1671 was really a bloody one, and extraordinarily sharp and severe, hurrying many to their graves. At the outset blood was voided plentifully, with griping pains; there might be twenty stools in a day. Some were able to rise after a week; but the malady would go on for several weeks or even months. It was protracted also in fatal cases, the end being marked by watchfulness, roughness of the tongue, thirst and thrush in the mouth. He gives a case of a strong young man who recovered after having had not only terrible bloody stools, but also bloody vomit, which, Willis thought, might have come from ulceration of the stomach. But with good diet and treatment most of those attacked escaped death. Sometimes it became virulent and, as it were, pestilential, destroying many and diffusing its infection very largely by contagion.

It was most common, says Willis, in camps and in prisons, by reason of the stench of the places and the evil diet. From what Sydenham was told by Dr Butler, who accompanied Lord Henry Howard in his embassy to Morocco, the dysentery of North Africa was the same as that which prevailed in London, as an occasional epidemic, in 1669–70.

The dysentery of the siege of Londonderry and of the camp at Dundalk, both in the year 1689, have been described else-

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[1] *Obs. Med.* IV. cap. 3.

[2] *Pharmaceutice Rationalis*, lib. III. cap. 3.

where. During the same reign, Dr William Cockburn got fame and wealth by a secret remedy for dysentery, which was tried first on board the king's ships at Portsmouth[1]. In 1693–99, there was dysentery in Scotland and in Wales. Of Scotland in 1698, the climax of the "seven ill years," Fletcher of Saltoun says: "From unwholesome food diseases are so multiplied among poor people that, if some course be not taken, this famine may very probably be followed by a plague[2]." A Welsh practitioner, who graduated at Dublin in 1697 said, in his thesis, that dysentery had raged for the space of three years in several maritime regions of South Wales so severely and had made such havock that in not a few houses there were hardly one or two left to bury the dead[3]. Writing before the seven ill years, Sir Robert Sibbald mentions dysentery as one of the *dira morborum cohors* that everywhere affected the Scots peasantry in the end of the 17th century, the causes of which were coarse food and excesses in spirit-drinking. In the century following we hear of dysentery in Scotland in particular years, which correspond on the whole to the unwholesome seasons in England. Thus in 1717, special mention is made of a fatal bloody flux in Lorn, Argyllshire. In 1731 there were dysenteries in Edinburgh in autumn, often tedious, rarely mortal. In 1733, during the harvest months, dysenteries were frequent and mortal in Fife, especially along the shores of the Firth of Forth. In the following autumn (1734) many in Edinburgh were seized with a dysentery, which continued more or less epidemic all the winter: "It had the ordinary symptoms of slight fever, frequent stools, for the most part bloody and mucous, violent gripes and an almost constant tenesmus"—being fatal to some and very tedious to others[4]. This was a well-marked dysenteric period in Scotland, but just as much a rare or occasional experience as the corresponding epidemic a century after in 1827–30. It appears to have lasted in various parts of Scotland until the end of 1737. A regimental surgeon, who was stationed at Glasgow in the end of 1735 and afterwards at Edinburgh, had 190 dysenteric patients (civil and military) from December, 1735, to

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[1] *Supra*, p. 103.

[2] Andrew Fletcher, *Two Discourses, &c.* No. 2. p. 2, 1698.

[3] John Jones, M.D., *De Morbis Hibernorum specialim vero de Dysenteria Hibernica. Accesserunt nonnulla de Dysenteria Epidemica.* Inaug. Diss. Trin. Col. Dub. Londini, 1698, p. 12.

[4] *Edin. Med. Essays and Obs.* I. (1733) 37, II. 30, IV. V.

February, 1738[1]. The summer and autumn of 1736 appear to have been its more severe seasons; it is heard of at St Andrews and in the country near it, at Kingsbarns and Crail (where "many of the boys" were seized), at Dalkeith, and in Glasgow and the neighbourhood, where one practitioner claims to have treated "some hundreds" with cerate of antimony[2]. In the great period of epidemic fever shortly after, the years 1740 and 1741, flux in the Edinburgh bills of mortality has respectively 3 and 36 deaths, which would probably have meant thirty to fifty times as many cases[3].

The English epidemiographists, Wintringham, Hillary and Huxham, mention dysentery in certain years, which were the seasons of high general mortality. Wintringham's first entry for York is under the year 1717, his second in 1723 (autumnal), a third in 1724 (some fluxus alvi with blood), in 1726 diarrhoeas and dysenteries "called morbus cholera," and the same for two or three weeks of September, 1727. Wintringham was one of the first in England to emphasize the seasonal connexion between dysenteries and agues. There was undoubtedly dysentery among the many forms of sickness in the disastrous years 1727–29. Huxham includes it among the fluxes which were common at Plymouth in 1734–36. A still greater dysenteric period followed the influenza epidemic of 1743, Huxham being again the chief chronicler of it[4].

In the second half of the 18th century, two periods were specially noted for dysentery, the years about 1758–62 and 1780–82. The first of these called forth perhaps the only medical piece written by Dr Mark Akenside, physician to St Thomas's Hospital and author of the 'Pleasures of the Imagination[5],' as well as accounts by Sir G. Baker[6] and Sir W. Watson[7]. All three writers agree that the true epidemic

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[1] James Stephen, surgeon to Gen. Whetham's regiment, in Pringle's collection of accounts of the "Success of the vitrum Antimonii ceratum." *Ibid.* v. pt. 2, p. 179, 4th ed.

[2] Professor T. Simpson, of St Andrews, Andrew Brown, of Dalkeith, John Paisley and John Gordon, of Glasgow. *Ibid.*

[3] *Gent. Magaz.*, 1741, p. 705.

[4] The "epidemic constitution" of 1743 was so markedly dysenteric after the influenza in the spring that Huxham regarded the dysentery as a sequela of the influenza.

[5] Mark Akenside, M.D., *De Dysenteria Commentarius*, London, 1764.

[6] George Baker, M.D., *De Catarrho et de Dysenteria Londinensi Epidemicis utrisque An.* MDCCLXII. *Libellus*, Lond., 1764.

[7] William Watson, M.D., in *Phil. Trans.* LII. pt. 2 (1762), p. 647.

prevalence occurred in London in the autumn of 1762. It is clear, however, that Akenside had been treating in St Thomas's Hospital since 1759 many cases of true dysentery (which he defines as a bowel complaint with gripes, tenesmus and bloody or mucous evacuations). He had more than one hundred and thirty cases of it described in his ward-books in the five or six years previous to his writing (1764); he had proved the good effects of ipecacuanha on many in 1759; and he had remarked that the autumnal dysenteries of 1760, 1761 and 1762 in each case lasted the whole winter, not abating until the spring. Perhaps this may have been a special experience of the Surrey side of the Thames; for both Watson and Baker are clear that dysentery was something of a novelty to them in the early autumn of 1762. Says the former, writing to Huxham on 9 Dec. 1762: "We have had here this autumn a disease which has not been in my remembrance epidemic at London. Very few of our physicians have seen this disorder as it has appeared of late. You mention it as frequent at Plymouth in the year 1743...." And Baker begins his essay by saying that there became epidemic in London in the end of July, 1762, the disease of dysentery—"morbi genus hac in civitate novum feré, aut nuperis saltem annis inauditum[1]."

The three observers agree that it attacked the poorer classes, children more than adults, convalescents, lying-in women and the like. Akenside says that it was mostly a slow non-febrile disease (in the autumnal outburst of 1762, the subjects of it were more fevered), and that some patients came to him who had been labouring under it for two or three months. His account agrees on the whole with Sydenham's for the years 1669—72: some had vomiting, some had a painless flux following the dysentery, some had dropsy as a sequel. In cases about to end fatally there was a remission of the griping before the end; in some there were aphthae of the mouth, stupor, and somnolence, with cold sweats. Watson saw three children (of four or five years) die from debility a week or more after the gripings and discharges had ceased; they could keep down no food, and were greatly emaciated. In another case, a young child, the motions were pure blood, and death followed on the third day. Baker gives Hewson's notes of the anatomy in a case that was clearly one of follicular dysentery, as well as Charlton Wollaston's account of two other anatomies (mixed catarrhal and follicular), with plates of the dysenteric bowel.

Watson, physician to the Foundling Hospital, says that the dysentery, or dysenteric fever, was very prevalent among the children in 1762, the year of its most general prevalence[2]. It

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[1] Pringle also, who was well acquainted with the dysentery of campaigns, speaks of the London epidemic as an exceptional occurrence, and as having caused few deaths.

[2] *Med. Obs. and Inquiries*, IV. (1771), p. 153.

may have been part of that dysenteric "constitution" which caused the following outbreak among the foundlings at the hospital at Westerham, Kent, a branch of the Guilford Street charity: "26 January, 1765. The apothecary visited the children at the hospital at Westerham, January 12th, 1765, and found twenty ill with dysenteries, many of whom had the whooping-cough complicated with it. Two of them are since dead, which, with six that died before he went down, make eight dead of that disease." Two cases of dysentery were in the Infirmary of the Foundling Hospital in London on the 2nd of March, 1765[1]. These accounts of dysentery in London in the middle third of the 18th century show it to have been then a very occasional malady and a very small contributor to the bills of mortality.

Next to the capital, the town that seems to have had most dysentery in the 18th century was Newcastle, which had been also the seat of frequent and severe plagues. There was much dysentery in it and in the neighbouring places on Tyneside during the autumns of 1758 and 1759, but the disease was not epidemic in 1762, the season of the malady in London[2]. It was prevalent among the same classes in Newcastle as in London—the poorer households, children, weakly persons. It recurred in the harvest quarter, in fine clear weather, when the days were almost as hot as at midsummer, but the evenings and mornings remarkably cold and the nights frequently foggy. The reason why the lower class of people were most liable to it seemed to be their "negligence in the article of cooling after heats by labour, exercise, &c." But there may have been something also in the soil and situation of Newcastle which made these common risks to be followed by so special an effect.

The Newcastle dysentery of 1758–59, two or three years earlier than the London epidemic, was the occasion of the essay by Dr Andrew Wilson, a work which compares favourably with the writings of the metropolitan physicians. Among the symptoms of true autumnal dysentery he gives the following:

> "Constant fever, drought, parchedness of the mouth and throat, dejection of the spirits, prostration of the strength, frequent viscid, acid or bilious vomiting, flatulency in the belly, wringing pain in the lower part of it, and often in the same region of the back; these pains sometimes constant, but always preceding stools; an almost constant pressing to stool, with great pain and irresistible tendency to it at the same time, called a tenesmus; the

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[1] MS. Infirmary Book of the Foundling Hospital.

[2] *An Essay on the Autumnal Dysentery.* By a physician (Andrew Wilson, M.D.), Lond., 1761 (Preface dated Newcastle, 25 March, 1760), pp. 1, 23.

stools generally bloody, always slimy, and full of glary stuff, sometimes mixed with a whitish matter of less tenacity, which appears in separate little curdled-like parcels, often with blackish corrupted-like bile; the stools always odiously fetid; they are seldom natural without the assistance of purgatives, and then they are often discharged in hard, dry little lumps; dryness of the skin, except when clammy unbenign sweats are raised by the intenseness of the gripings and tenesmus; great watchfulness, their sleep, when accidentally they drop into any, being short and broken, with recurring pains which awake them unrefreshed. These are the principal symptoms which attend a true febrile dysentery. When such a disease is epidemic there are many slight appearances of it which happily do not extend to all these complaints, and which easily yield to proper applications.

The signs of danger in this disease are the violence with which all the above symptoms appear. But the signs of immediate danger are, decrease of pain, great sinking of the spirits, lowness of the pulse, beginning coldness of the extremities, parchedness and blackness of the tongue, aphthae; white scurf or ulceration of the throat and fauces, and constant hiccup. When there is a cessation of pain, intolerably fetid and involuntary stools, shiverings, with sometimes a sense of coldness in the belly, a slight delirium, and often unaccountable fits of agony, or rather anxiety; then the case is beyond remedy, and the patient hastens to dissolution. This stage of the disease is generally attended with a small obscure pulse and cold extremities, but I have seen it in some particular cases otherwise.

...When dysentery is epidemic, it is not uncommon for people who escape the dysentery itself to have their stools altered from their natural colour to sometimes a greenish hue, as if they had eaten much herbs, sometimes of a clay colour, and sometimes quite blackish, as if they had eaten a quantity of blood....In 1759 particularly, it was very common for numbers of people who escaped the dysentery to be troubled with flatulencies, slight gripings and twitchings in the belly, which was generally attended with blackish stools. Stranguaries were likewise pretty frequent, and icteric complaints, or the jaundice. The stranguary was a very common symptom in many fevers which occurred during the prevalency of the dysentery. Another complaint which frequently occurred during the last dysenteric season was dry gripes.

The dysentery this last season [1759] differed in many respects from its appearance in the former season. In the latter season greater numbers had it in that slight degree which was attended with little fever and no danger. In many who were seized with seemingly great violence, it was unexpectedly checked when there appeared all reason to apprehend it would have run to a much greater length. It was not uncommon to find it complicated with agues, rheumatisms, &c., into the latter of which it frequently degenerated. In the former season the griping pains attending it were confined to the lower belly. In the latter they were very ordinarily felt also in the back, along, as might be supposed, the windings of the rectum and colon; yet, after the dysenteric stools were in a great measure gone, and the disease over, these pains often remained, or assumed the appearance of a lumbago or sciatic, with pains striking down the thighs....The more the season advances, and the later in the year it is when persons are seized with this epidemic, the more chronical do the symptoms of it grow."

The last sentence is probably the explanation of Akenside's original point, that dysentery was as much a winter as an autumnal malady, not really abating until the spring. Wilson himself claims originality in the following point relating to the sluggishness of the bowels in dysentery, his treatment having been largely determined by that view of the pathology:

"During the increase and height of this distemper, it is very improperly called a flux. A proper flux, or diarrhoea, is a constant flow of immoderately liquid but otherwise natural stools, dissolved by too great an irritation upon, or too great a relaxation of, the vessels destined for mollifying the faeces and lubricating the passages by their humours; by which means they are disposed to dismiss a superfluous quantity of them. But in the dysentery the passage of the natural discharges is resisted, and their consistence is often increased to such a degree that, when they are urged along by the assistance of purgatives, they are excluded in unnaturally hard and dry, little lumps or balls" (p. 3). The question whether scybala were [illegible] essential character of dysentery was often referred to in later writings.

Nothing more is heard of dysentery at Newcastle until the date of the opening of the dispensary there, 1 October, 1777. From that date to 1 September, 1779, when the disease was not epidemic there, 72 cases were treated from the dispensary.

Some importance, as regards priority, attaches to one of Dr Andrew Wilson's observations of the Newcastle dysentery of 1759: "It was not uncommon to find it complicated with agues, rheumatisms, &c., into the latter of which it frequently degenerated." The pains, he says, were not confined to the lower belly, but were felt also in the back; or, after the dysentery was gone, the muscular pains remained as a lumbago or sciatica, striking down the thighs. This curious relationship of dysentery to rheumatism, shadowed forth in the Newcastle essay of 1761 [1760], was formally stated by Akenside in his essay of 1764, being perhaps the best of his various attempted originalities. It was afterwards taken up in Germany by Stoll, Richter, Zimmermann and others in the 18th century, and was illustrated from the Dublin epidemics of the 19th century by O'Brien[1] and Harty[2]. The doctrine of a relationship between dysentery and acute rheumatism has been discovered in the 7th century writer, Alexander of Tralles, but erroneously. The Byzantine writer does indeed introduce into two paragraphs on bowel-complaint the word *ῥευματισμός*—one of them relating to the alvine profluvium attending fevers or following fevers, the other relating to "dysenteria rheumatica[3]." But it is clear that he is merely ascribing to the diarrhoea in the one case and to the dysentery in the other a rheumy nature, on certain theoretical grounds of humoral pathology; there is no reference to joint pains or muscular pains, or to anything else connoted in the later use of the word rheumatism. The idea is originally an English one, from the middle of the 18th century, and belongs most properly to Akenside, although Wilson, a not less trained and capable observer, had recorded the empirical fact three or four years earlier. Akenside was led to regard dysentery "as a rheumatism of the intestines," and to maintain that "the cause and the *materies* of each disease were similar[4]." Stoll adopted these phrases, adding that dysentery differed from rheumatism of the joints "merely in form and situation." But for a few empirical facts, the relationship would be thought fanciful. These, however, may be finger-post instances, pointing to the true pathology of a somewhat mysterious malady. They are simple enough: e.g. cases of dysentery have "degenerated," as Wilson said, into rheumatism; or cases of acute rheumatism, treated by purging, have

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[1] *Trans. K. and Q. Col. Phys.* v. (1828), p. 221.

[2] *Obs. on the History and Treatment of Dysentery and its Combinations, etc.*, 2nd ed., Dublin, 1847.

[3] *Alexandri Tralliani Medici libri duodecim.* Basil, 1556, Lib. VIII. pp. 423, 432.

[4] Akenside, *l. c.* "Ut dysenteriam jam pro rheumatismo intestinorum habeam, et similem utriusque morbi causam et materiem esse contendimus."

developed the gripings, tenesmus and stools of dysentery; or, in a time of dysentery, cases have occurred in which the symptoms of the latter were joined to those of acute rheumatism, or cases in which the symptoms of the one disease obtained, say for twenty-four hours, to give place to the symptoms of the other. Again there are countries such as Lower Egypt where the frequency of dysentery is not more remarkable than the frequency of rheumatic fever. Harty points out that the rheumatic complications of dysentery seem to have arisen only when the latter malady was improperly treated by opium and astringents; but, howsoever the signs of affinity were called forth, they may prove to be true indications for the pathology. The circumstances of taking dysentery are those of taking rheumatic fever—exposure to chill after being heated with labour[1]. In rheumatism the effect of the chill falls upon the great groups of voluntary muscles, pain being manifested at the surfaces where the muscular work is applied, namely the joints; while the redness, heat and swelling are as if restricted to the tissues by which the muscles become effective, namely the tendons, aponeuroses, ligaments and synovial membranes[2]. In dysentery, it may be said, the effect of the chill falls upon the great involuntary muscle, that of the intestine, or upon a section of it, a muscle which serves, so to speak, as its own tendons and insertions, and is the seat of its own pains, while the tissues next to the muscular, the submucosa and mucosa with the lymph-follicles, become the seats of congestion, inflammation and suppuration. In acute rheumatism, the muscles generate heat without doing any work; in dysentery there is often febrile heat (although not invariably), and the work of the involuntary muscle is paroxysmal and ineffective. In some such way the parallel suggested by Akenside might be followed out.

After 1762, the next period of epidemic dysentery in England was from about 1779 to 1785, a period when agues also were epidemic, as well as workhouse fevers and typhus under its various names. In London it was prevalent in the autumns of 1779, 1780 and 1781, a strictly autumnal disease like the diarrhoea of children or the cholera nostras of adults. From the list of symptoms, the latter disease must have formed part of the dysenteric epidemic:—"profuse watery evacuations, mucous evacuations mixed with blood, gripings, tenesmus, pain in the back and loins, fever." Some had tormina without flux. Some few old and infirm died; but usually the malady yielded to treatment[3]. It is heard of also at Liverpool about 1784[4], and its prevalence at Plymouth called forth an essay[5]. It must have been a considerable disease in the dockyard towns; for a

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[1] Hirsch, III. 333 (Eng. transl.): "As to the influence of an extreme diurnal range of the thermometer (cold nights after very hot days) there is almost complete agreement among the observers in those parts [tropical and subtropical] of the world."

[2] I have enunciated this view of the pathology of acute rheumatism more fully in the Article "Pathology" in the *Encyclopaedia Britannica*.

[3] *Lond. Med. Journal.* Editorial note, II. 211. The parish register of Finchley shows double the average mortality in 1780, and indicates dysentery as a fatal malady. Lysons, *Environs of London*.

[4] Moss, u. s.

[5] Francis Geach, F.R.S., *Some Observations on the present Epidemic Dysentery*, 1781.

body of troops, originally numbering 2800, which arrived at Kingston, Jamaica, in the beginning of August, had been put on board the transports in March with much dysentery and putrid fever among them, so that the diseases with which they put to sea became more violent during the five months' voyage, and caused many deaths. Arriving at Jamaica, four hundred were sent on shore sick, exhausted with flux and fever, of whom scarce the half recovered in the military hospitals[1]. Here we have the singular fact of transports from England bringing dysentery to Jamaica. On the other hand, Clark, of Newcastle, who had seen much of tropical maladies, says that the dysentery which became epidemic there in 1781 was introduced first into a dockyard by some sailors returned from abroad ill of the complaint, and that it soon spread among the workmen, of whom several died. But it was epidemic in London the same year; and in Newcastle itself there were extensive epidemics in 1783 and 1785, for which no foreign source was sought or found. In those years it "attacked great numbers of the poor," as well as some of the richer class, to which Clark's eleven cases from the epidemic of 1785 mostly belong. In the Tables of diseases treated at the Dispensary, the epidemic dysentery of 1783 and 1785 is credited with 329 cases, of which 17 were fatal; but these, of course, were but a fraction of all that occurred in Newcastle and neighbourhood. Every year until 1805 there are a few cases of dysentery in the Dispensary books; but they become fewer to that year (except in 1801 when there were 23 cases), and at length disappear from the list altogether. A remarkable outbreak of dysentery, within narrow limits, occurred in a fishing village or "town" in the neighbourhood of Aberdeen during some months of the spring and summer of 1789: "It has proved fatal to numbers. As such a disease could not be admitted into our hospital, a temporary one has been fitted up for those that are worst, and the faculty here have given their attendance by rotation[2]."

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[1] Dennis Ryan, M.D., "Remittent Fever of the West Indies." *Lond. Med. Journ.* II. 253, iii. 63.

[2] Dr Livingston to Dr Lettsom, Aberdeen, 29 June, 1789, in *Memoirs of Lettsom*, III.

Dysentery in the 19th century.

Willan, who was practising in London as early as 1785–6, says that dysentery had not been epidemic there from the autumn of 1780, until the autumn of 1800, his position at the Public Dispensary in Carey Street enabling him to know the prevalent diseases. In the autumn of 1800 the epidemic was extensive. There were, he says, some sporadic cases every autumn, but he never saw a fatal case of it[1]. In Bateman's continuation of the same records from 1804, dysentery first appears in 1805 and remains sporadic every autumn. It was "very prevalent" in the autumn and winter of 1808, but not fatal; and it was not unusual among the dispensary patients every year until these records end in 1816[2]. The years 1800–02 form one of the more distinct dysenteric periods also for Ireland and Scotland. Old Glasgow practitioners in the severe epidemic of 1827–28 recalled the fact that they had last seen the disease about 1802, and the books of the Glasgow Infirmary bore witness to its prevalence from 1800 to 1803 or 1804. In 1801–2 there was a good deal of it also at Hamilton, among a regiment of dragoons as well as among the people at large[3]. The troops in various parts of Ireland suffered from it in the same years[4]. In 1808, during a somewhat unwholesome season in which agues also were met with, some cases of dysentery were admitted to the General Infirmary of Nottingham[5]. An altogether exceptional outbreak of a dysenteric nature occurred in 1823 among the prisoners in Milbank Penitentiary[6].

The great dysenteric period of the 19th century coincided with, or followed, the two hot summers of 1825 and 1826, the latter of which was probably the hottest and driest summer of the century. Of its prevalence in and near Leeds in 1825, Thackrah says it was "before almost unknown as an epidemic to the

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[1] Willan, *Report on the Diseases etc.*, p. 42. The nearest approach to a fatality in dysentery, he says, happened in the case of a lady residing in Spa Fields, at whose window a brown owl, attracted by the solitary light, came flapping and hooting at midnight, to the great aggravation of the patient's symptoms.

[2] Bateman, u. s.

[3] *Glasg. Med. Journ.* IV. (1831), pp. 5, 229.

[4] Cheyne, *Dubl. Hosp. Reports*, III. (1822), p. 3. At Limerick, from June to September, 1821, there were 47 cases among the men of the 79th regiment.

[5] Clarke, *Edin. Med. and Surg. Journ.* IV. 423.

[6] A. C. Hutchinson, *Statement of the extraordinary sickness at the Penitentiary at Milbank*, Lond. 1823; P. M. Latham, M.D., *Account of the Disease lately prevalent at the General Penitentiary.* Lond. 1825.

present practitioners of this district." In the same summer it was unusually common in Dublin, and was epidemic the next year in other parts of Ireland as well (*supra*, p. 271). In Glasgow it began about the end of July, 1827, in the flat district to the south of the Clyde, and in the course of the autumn became prevalent in all parts of the city. An outbreak of plague itself could hardly have caused more surprise, so strange was dysentery to that generation. A few deaths by it in one crowded street of the Gorbals were mentioned in a newspaper before the disease had become general, and "gave rise to that groundless fear which pervaded and distracted the public mind during the whole course of the epidemic[1]."

The symptoms were severe and alarming, but the fatalities were few, perhaps not more than one in fifty attacks. The proper dysenteric symptoms usually lasted from ten to fourteen days, and were followed by diarrhoea, it might be, for many weeks. The morbid anatomy showed in the mucous membrane of the great intestine the three degrees of congestion, follicular ulceration and sloughing of the whole mucous coat (in the sigmoid flexure and rectum). The cases were nearly all above the age of puberty, and among the poorer classes. September and October were the worst months. The weather was remarkably close, damp and relaxing. One practitioner saw two cases of genuine ague in natives of Glasgow, having never seen a case of ague before. The ordinary cholera nostras of summer and autumn was much less frequent than for several years before, and it was the general remark that it had given place to the dysentery.

Having declined in the winter of 1827–28, it revived in May, and again reached a great height in the autumn of 1828, while cases of it (probably chronic, or renewals of old attacks) continued to the summer of 1830. The following table shows the number of cases treated by the poor's surgeons in the several seasons, 1827–30; the 435 cases in the autumn of 1827 were nearly a third part of all the cases so treated (1462):

Cases of Dysentery in Glasgow treated by the Surgeons to the Poor.

Quarter	1827	1828	1829	1830
Feb.—April	—	28	29	26
May—July	—	62	35	26
Aug.—Oct.	435	261	50	—
Nov.—Jan.	143	68	22	—

It extended to the villages and country districts all round Glasgow. It was believed to be somewhat general in Scotland in 1827–28, but the only answers to a circular of queries sent out by the editors of the 'Glasgow Medical Journal' came from

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[1] James Wilson, *Glasgow Med. Journ.* I. (1828), p. 40.

Hamilton (and Bothwell), Ayr and Callander (including the flooded valley of the Teith and the Braes of Balquhiddar)[1].

In Edinburgh the outbreak of dysentery began about the end of July, 1828, a year later than in Glasgow, just as the epidemic in that city was a year or more later than in Dublin. Attacks of it were numerous among the patients admitted to the Edinburgh Infirmary for other diseases; but it occurred at the same time throughout the city generally and in the country around; "nor has it been confined entirely to the lower orders." In the imperfectly kept register of the Infirmary there were 42 admissions, with 11 deaths, from August to October. Christison, who treated some of these, had never seen dysentery before[2]. The morbid anatomy was the same as at Glasgow—congestions, numerous small ulcerations especially of the transverse colon, or sloughing of considerable portions of the mucous membrane.

In the same years 1827–28 there was much dysentery in the Lunatic Asylum at Wakefield. It is well known that aged paupers in workhouses or asylums are peculiarly subject to the epidemic influences that produce diarrhoeal or choleraic sickness, and there had been much of that disease in the West Riding Asylum from its opening in 1819. Some cases of dysentery had also occurred, but it was not until after the exceptional summer of 1826 that they became common. In 1828 there were 55 cases among 375 inmates, mostly in old and incurable lunatics, the fatalities being at the very high rate of one in four. The morbid anatomy was that of true dysentery—follicular ulceration in the transverse colon, with occasional sloughing of large pieces of the mucous membrane. The whole sewage of the asylum collected in cesspools or "tanks of ordure" within a few feet of the wards[3].

The causes of the rare and surprising outbreak of dysentery in 1827–28 were much debated. In Glasgow it was remarked that the choleraic complaints of the summer and autumn were much less frequent than usual; also that the first season of it, the year 1827, was remarkable for rain every day for some months, and for a close, oppressive, relaxing atmosphere. Brown, of Glasgow, thought the weather might account for it, the labouring class being thereby made peculiarly subject to heats and chills, which, grafted upon the usual bowel-complaints of the season, easily

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[1] James Wilson, *Glasgow Med. Journ.* I. 39; James Brown, *ibid.*; Macfarlane, I. 99; Paterson, I. 438; Editors, IV. 1; Hume (Hamilton), IV. 14, and 229; McDerment (Ayr), IV. 19; Macnab (Callander), IV. 241.

[2] Christison, "Notice on the Dysentery which has lately prevailed in the Edinburgh Infirmary." *Edin. Med. Surg. Journ.* XXXI. (Jan. 1829), p. 216, and in *Life of Sir Robert Christison*, "Autobiography," I. 376.

[3] W. H. Gilby, M.D., "On the Dysentery which occurred in the Wakefield Lunatic Asylum in the years 1826, 1827, 1828 and 1829." *North of Eng. Med. and Surg. Journ.* I. (1830–31), 91.

turned them to dysentery. Dr Andrew Buchanan was of opinion that exhalations from the soil were the chief, if not the sole, exciting cause of dysentery, reserving the question of contagiousness. Other forms of miasmatic febrile disease, formerly rare, had, he said, made their appearance of late years and become epidemic. Christison had already spoken in the same sense for the Edinburgh outbreak. For five or six weeks, he said, before the dysentery appeared there in the end of July, 1828, the tendency to bowel affections during the epidemic fever (which was chiefly of the relapsing type) was increased in a very marked degree. The same tendency continued throughout the whole progress of the dysentery; "nay in some instances true acute dysentery was formed during the height or towards the termination of continued fever; and now that the dysentery has in great measure disappeared, or assumed a mild form, the tendency of low gastro-enteric inflammation to accompany continued fever is very strongly marked, perhaps is more frequent than ever." This may relate to a remarkable outbreak of fever among the richer classes in the New Town of Edinburgh, more talked about than written on, which seems to have been enteric or typhoid, according to the clinical history of a case of it that came from Edinburgh to Hamilton and was recorded by a physician of the latter place[1]. It was more especially that strange epidemic in Edinburgh that Dr Andrew Buchanan had in mind when he wrote that the dysentery of 1827–28 was not the only disease due to exhalations from the soil with which Scotland had of late been visited[2]. This is an instructive line to take in seeking

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[1] Hume, "Case of the Edinburgh New Town Epidemic." *Glasgow Med. Journ.* IV. 229.

[2] *Ibid.* IV. 7. The following is Buchanan's reference to it: "The only epidemic fever belonging to the family of diseases we are here considering that occurred in Scotland during the *dysenteric* years was that of the New Town of Edinburgh, in 1828, of which we have already spoken. As our knowledge of this fever is not derived from any source on which we can certainly rely, it is possible that we may have formed an erroneous opinion respecting it; but from all we have heard of its symptoms and mode of distribution, we are disposed to consider it as totally different in nature from the common fever of this country. The latter circumstance alone, the mode of distribution of the disease, is, we think, perfectly sufficient to demonstrate our proposition. Instead of occupying the Cowgate, the Grassmarket, and the High Street, the usual haunts of typhus, this fever had its head-quarters in Heriot Row and Great King Street; and, according to our information, it extended from the last mentioned street in the direction of the Water of Leith, and from Leith, along the shore, to Musselburgh. We do not vouch for the accuracy of these minute details, but we believe the important fact to be beyond doubt that this fever prevailed chiefly, not in the districts where typhus is invariably to be met with, but in the most fashionable parts of the New Town."

an explanation of the dysentery of 1827–28, even if we keep something of the old doctrine of heats and chills as affecting those who labour in a damp atmosphere. The ground-water theory of miasmatic infective diseases was not then formulated: but there has rarely been in our latitudes so signal an instance of extreme drought and heat followed by excessive dampness as in the two years 1825 and 1826, and the year 1827. The second dry year, 1826, was certainly the season when enteric fever was described and figured for the first time in London. It was said, also, that enteric cases occurred among the relapsing fever and dysentery of Dublin in the same year; and enteric cases are known to have occurred in Edinburgh towards the end of the epidemic of relapsing fever and dysentery, which was one or two years later in that city than in Dublin. In Glasgow, where the dysentery was probably a more extensive outbreak than elsewhere, there appears to have been at that time no enteric fever; in London, on the other hand, where there was a good deal of the latter, there does not appear to have been any notable prevalence of dysentery.

Along with the cholera nostras which was unusually common in the autumn of 1831, just before the outbreak of Asiatic cholera, there was some dysentery, notably an epidemic at Bolton[1]. At the end of the Asiatic cholera of 1832 a succession of cases of dysentery occurred in the Edinburgh Charity Workhouse[2].

The next occasion of dysentery was the autumn of 1836, which was, like that of 1827, a wet season. The outbreak at Glasgow on this occasion is recorded only in a few figures (the medical journal of the city having ceased to appear for a time), according to which there were 144 cases throughout the year treated by the surgeons to the poor, of which 8 were fatal, and 15 cases sent to the Infirmary, of which 4 were fatal[3]. At Dundee also, from October to December, 1836, bowel-complaints were not unusual among the cases of typhus, which occurred in hundreds. "Many of the cases of diarrhoea and dysentery,"

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[1] James Black, M.D., *Edin. Med. Surg. Journ.* XLV. (1836), p. 63. "As the epidemic was ushered in and was accompanied during the half of its course with cholera, fever of a typhous character followed close in its train among the working and lower classes, and continued more or less during the first months of winter, after dysentery had totally disappeared." The latter had not been seen again down to 1835.

[2] J. Smith, *ibid.* XLII. (1833), p. 342.

[3] Cleland, *Trans. Glasg. and Clydesd. Statist. Soc.* I. 1837.

said Arrott, "occurred in December, and were accompanied by catarrhal and rheumatic symptoms, implying an origin distinct from the bilious diarrhoea and bilious vomiting of summer." Of 22 cases of dysentery at the Infirmary, 2 were fatal[1].

Next year, 1837, there occurred in Somersetshire a remarkable epidemic which was for the most part dysenteric. It was seen first at Bridgewater, and in July it caused two deaths at Taunton, where it afterwards prevailed with high malignancy. Of 223 deaths, 206 were set down to dysentery, 16 to diarrhoea and 1 to cholera; the high ratio of children's deaths in the following table of ages is in accordance with other recent experiences to be given in the sequel:

Ages	0–5	–10	–15	–20	–30	–40	–50	–60	–70	–80	–90	Over 90
Deaths	93	17	11	7	6	3	7	16	26	24	11	2

The monthly mortalities were, 75 in August, 105 in September, 29 in October, 10 in November, 2 in December. The epidemic spread partially amongst the unions around Taunton[2].

In London from the beginning of registration (1837) until 1846, the deaths set down to dysentery averaged fully a hundred in the year—a statistical fact to which there is nothing corresponding in contemporary writings: Watson said it was hardly ever seen in practice except in the chronic form among sailors and soldiers who had contracted it abroad. During the prevalence of the "Irish fever" of 1846–48, the disease was truly epidemic and a cause of many deaths along with typhus itself, especially in Liverpool and mostly among destitute Irish. In 1846 it was in Milbank Penitentiary[3]. A most instructive instance of its connexion with the Irish emigration occurred at Penzance in the summer and autumn of 1848.

The brig 'Sandwich' sailed from Cork for Boston, U.S., in the end of May, carrying a number of Irish farmers and their families. Having met with rough weather and head winds she put in leaky to Penzance on 7 June, sixteen days out from Cork. The provisions had been bad and there was sickness in the ship, with a very filthy state of things. Three of the women passengers died on shore of dysentery. The ship sailed again on 10 July, two more of the emigrants dying of dysentery before she reached Boston, while two of the crew survived the attack. On 16 July, two cases of the same disease occurred among the lower class in Penzance, and thereafter the epidemic spread widely through most parts of the town and the three adjoining parishes of Madron, Galval and Paul, causing a great mortality, as in the following table:

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[1] Arrott, *Edin. Med. Surg. Journ.*, Jan. 1839, p. 121.

[2] Farr, in *First Report of the Registrar-General*, 1837–8, p. 103.

[3] Baly, *Pathology and Treatment of Dysentery*. London, 1847.

Deaths from Dysentery in Penzance and three adjoining parishes.

1848

	Deaths from Dysentery in Penzance town	Deaths from Dysentery in 3 other parishes	Total deaths from Dysentery	Deaths from all causes in Penzance and 3 other parishes
July	5	0	5	31
August	37	1	38	71
Sept.	26	12	38	67
Oct.	13	9	22	48
Nov.	1	1	2	31
	82	23	105	248

As many as five hundred cases were under medical treatment in the town. No death occurred there or in the three parishes within the registration district after 10 November, "but very many in the country beyond its limits." Of the 105 deaths in the table, 46 were of young children, 35 of aged persons, and 24 between the ages of five and sixty years[1]. There was no resisting the evidence that an infection had been introduced by the weather-bound Irish emigrants; instances were also known of new foci in the country districts having been created by domestics or others suffering from dysentery who had been sent from Penzance to their homes. At the same time the summer had been exceptionally wet, the rainfall having been as follows:

	Inches of rain		Inches of rain
May	0·777	Sept.	3·042
June	3·287	Oct.	4·425
July	3·277	Nov.	3·981
Aug.	4·972		

A singular epidemic of dysentery occurred between the 14th and 26th September, 1853, among the thirty-six inmates of a row of nine cottages near the village of Hermiston, five miles west of Edinburgh. Seven children were attacked, of whom six died, and six adults, who all recovered. Besides these there were three cases among the four inmates of a cottage about a hundred yards away, and one case in each of two houses in the adjacent village of Hermiston. Christison found that a drain which received the sewage or slops of the hamlet was in a most offensive state, having been choked probably for years, and that the water of a well near it was foetid. These are the conditions that have often caused village epidemics of enteric fever in recent times; but there was no doubt that the disease in this case was dysentery[2]. Another asylum outbreak of dysentery occurred in 1865 in the Cumberland and Westmoreland Asylum[3].

Perhaps the last general prevalence of dysentery was during the Asiatic cholera of 1849, when the house-to-house visitations in Leeds and some other towns brought to light a somewhat surprising number of cases mixed with the more ordinary bowel-complaints of the season.

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[1] Moyle, *Lond. Med. Gaz.* N.S. VII. Dec. 29, 1848, p. 1093.

[2] Christison, "On a local Epidemic of Dysentery." *Month. Journ. Med. Sc.* XVII. (Dec. 1853), 508.

[3] T. S. Clouston, *Med. Times and Gaz.* 1865, I. 567.

It is impossible to trace the subsequent history of dysentery in England by the usual statistical means of the Registrar-General's tables of the causes of death, for the reason that dysentery, a rare and curious disease of all ages in this country, is merged with diarrhoea, one of the commonest causes of infantile mortality. However, it is not likely that any such epidemic outbursts, local or general, as those described for certain years of the 18th and 19th centuries could have occurred without their being otherwise known. It may be safely said that there has been little of it in this country for the last thirty or forty years, except among a few soldiers, sailors or others returned from abroad; in Ireland itself, the immemorial "country disease" has now only a small annual total of deaths.

One of the last experiences of dysentery in an English port was instructive for the relation of the disease to typhus fever.

On 16 February, 1861, an Egyptian frigate, the 'Scheah ehaed,' sent from Alexandria to be fitted with new engines, arrived in the Mersey. The only European on the ship was her commander, an Austrian. She carried 476 men, mostly Arabs, with a small proportion of Nubians and Abyssinians. Some two hundred were convicts, who had been brought on board in chained gangs. The passage had been long and stormy, and attended with much sickness, dysenteric and diarrhoeal; one man died and was thrown overboard two or three days before the ship reached Liverpool. The pilot who boarded her was at once struck by the horrible state of filth of the 'tween decks; he remained two days on board, and on returning home said to his wife, "This frigate will be heard of yet." He sickened in about a week of malignant typhus and died. Two others who boarded the ship took typhus, of whom one recovered. There had been no fever on board during the voyage. Thirty-two of the Arabs or Nubians were admitted to the Southern Hospital suffering, most of them, from dysentery or diarrhoea. Typhus fever attacked 17 of the ordinary patients, 2 nurses, 2 porters, 2 house-surgeons and 2 others in the hospital, of whom several died. The Arabs &c. to the number of 340 were taken in batches of 80 a day to a public bath, in which they remained three hours. Typhus broke out among the bath attendants. The whole number of cases of typhus traced to the ship was 31, of which 8 were fatal. The ship was sunk in the graving dock in order to clean her[1].

This is a classical instance of the breeding of typhus from the effluvia of dysentery, of which other instances, on a greater scale, have been given in connexion with the Jamaica expedition of 1655 (in the former volume), the siege of Londonderry and the camp of Dundalk in 1689, the hospitals after the battle of Dettingen in 1743, and the Irish famine of 1846–48.

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[1] W. H. Duncan, M.D., "On the recent Introduction of Fever into Liverpool by the crew of an Egyptian frigate." *Trans. Epidemiol. Soc.* vol. I. pt. 2. p. 246. (1 July, 1861).

CHAPTER IX.

ASIATIC CHOLERA.

THE Indian or Asiatic cholera, which first showed itself on British soil in one or more houses on the Quay of Sunderland in the month of October, 1831, was a "new disease" in a more real sense than anything in this country since the sweating sickness of 1485. The English profession had been hearing a good deal about it for some years before it reached our shores. The outbreak in Lower Bengal in 1817, from which the modern history of cholera dates, had been the subject of reports and essays by Anglo-Indian physicians and surgeons; an extensive prevalence of it in the Madras Presidency shortly after, as well as in Mauritius in 1819 and 1829, had been observed by other medical men in the service of the East India Company or of the British army or navy. Many who had seen cholera in India, and some who had written upon it, returned to England in due course, so that the formidable new pestilence of the East began to be heard of in medical circles at home. Various essays upon it issued from the English press between 1821 and 1830[1]; and in 1825 it appeared for the first time, and at considerable length, in the pages of an English systematic treatise, the new edition of Dr Mason Good's 'Study of Medicine.'

Previous to 1829, Asiatic cholera had obtained no footing in Europe. The first great movement westwards from India

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[1] James Boyle, surgeon to H. M. S. 'Minden,' *Epidemic Cholera of India*, London, 1821; W. B. Carter, *Cholera Indica vel Spasmodica*, Thesis, Glasgow, 1822; Thomas Brown, of Musselburgh, *On Cholera, more especially as it has appeared in British India*, Edin. 1824; Whitelaw Ainslie, M.D., *The Cholera Morbus of India*, Letter to the Court of Governors, H. E. I. C., Edin. 1825; A. T. Christie, M.D. (of Madras), *Obs. on the Nature and Treatment of Cholera*, Edin. 1828; Charles Searle (of Madras), *Cholera, its Nature, Cause and Treatment*, London, 1830 (dated 1st May, instigated, not by the Orenburg epidemic, but by the deaths of Sir Thomas Monro and others from cholera in Madras).

through Central Asia, which was continuous with the memorable eruption in Bengal after the rains of 1817, had reached to Astrakhan, at the mouths of the Volga, and had there caused the deaths of some 144 persons in September, 1823. Another progress westwards from India, after an interval of six years, reached the soil of European Russia in the Government of Orenburg in August 1829, the mortality in the whole province during the autumn and winter (to February, 1830) amounting to about one thousand. A much more severe epidemic of it arose in the summer of 1830 in the town and province of Astrakhan (supposed to have been introduced by an infected brig from Baku), which spread with enormous rapidity, destroying in the course of a month some four thousand in Astrakhan itself and upwards of twenty thousand in other parts of the province[1]. Thus established in the basin of the Volga, Asiatic cholera overran the whole of Russia. Before the spring of 1831 it had entered Hungary and Poland, and in the end of May had reached Danzig and other German ports on the Baltic and North Seas. Lord Heytesbury, the British Ambassador at St Petersburg, had sent home a despatch upon it early in 1831; in April, the Admiralty issued orders for a strict quarantine of all arrivals from Russia at British ports, which were afterwards extended to arrivals from all ports abroad invaded or threatened by cholera. On 20 June a royal proclamation ordering various precautions was issued, and next day a Board of Health was gazetted, composed of leading physicians in London and of the medical heads of departments, with Sir Henry Halford as president. Local Boards of Health were formed voluntarily in many parts of the country during the summer of 1831. Two medical men were at the same time commissioned by the Government to proceed to Russia to study the disease there, their letters to the Board of Health commencing from the 1st of July. The growing interest in the disease as it came nearer called forth another crop of writings, some of them based on old Indian experience, others speculative[2]. The most important of

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[1] See extract in *Glas. Med. Journ.*, Feb. 1831, p. 105, from *Scottish Mission. and Philan. Reg.*

[2] George Hamilton Bell. *Treatise on Cholera Asphyxia or Epidemic Cholera as it appeared in Asia and more recently in Europe*, Edin. 1831; Reginald Orton, *An Essay on the Epidemic Cholera of India*, 2nd. ed. with a supplement, London, 1831 (August); 1st ed. Madras, 1820; H. Young, M.D. (of the Bengal Service), *Remarks on the Cholera Morbus*, 2nd ed. 1831; Alex. Smith, M.D. (Calcutta), *Description of*

these was the treatise by Orton, which had been published in its original form at Madras in 1820. Writing from Yorkshire in August, 1831, he surmised (with a proviso that no one could say confidently what might happen) that Asiatic cholera might be expected to be a mild visitation upon Britain at large, falling most upon the large manufacturing towns in which typhus was common, but that it would be "far otherwise" with Ireland owing to its chronic poverty, distress and over-population. By a singular chance the only town which he specially mentioned in England was Sunderland, where, he had been told by Dr Clanny, there had been an unusual number of cases of malignant cholera nostras in the early part of the autumn: "it is greatly to be feared," he said, "that those are but the skirts of the approaching shower[1]."

In other places besides Sunderland there had been perhaps more than the usual amount of summer diarrhoea in 1831. Dr Burne, in his London dispensary reports, entered on the 2nd and 16th July an unusual prevalence of "dysenteric diarrhoea and cholera," and cases of scarlet fever of an "adynamic" type or with a tendency to fatal collapse[2]. (Clanny observed the same type of scarlatina at Sunderland along with some typhus.) Choleraic disorders were uncommonly rife on board the ships of war in the Medway[3]. A succession of twenty-four cases at Port Glasgow, from 2 July to 2 August, chiefly among workers in Riga flax, gave rise to an alarm of the real Asiatic cholera, the more readily that the first case was fatal (the only death)[4]. Similar alarms arose at Leith and Hull.

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the Spasmodic Cholera (substance of an old report to the Army Medical Board); W. Macmichael, M.D., *Is the Cholera Spasmodica of India a Contagious Disease?* London, 1831 (Sept.); T. J. Pettigrew, *Obs. on Cholera, comprising a description of the Epidemic Cholera of India*, London, 1831 (13 Nov.); John Austin, *Cholera Morbus, Indian and Russian Cholera*, London, 1831 (July); John Goss, late H. E. I. C. S., *Practical Remarks on the Disease called Cholera*, London, 1831 (Nov.); Whitelaw Ainslie, *Letters on the Cholera*, London, 1832 (from Edinburgh, Dec. 1831); Henry Penneck, M.D., *Nature and Treatment of the Indian Pestilence commonly called Cholera*, London, 1831 (Penzance, 24 Nov.); A. P. Wilson Philip, *Nature of Malignant Cholera*, London, 1832; *Official Reports made to Government by Drs Russell and Barry on Cholera Spasmodica observed during the Mission to Russia in* 1831, London, 1832; John V. Thompson, Dep. Insp. Gen. of Hosps. *The Pestilential Cholera unmasked*, Cork, 1832 (January).

[1] *Op. cit.* p. 469.

[2] *Lond. Med. Gaz.* 1831.

[3] James Hall, "Narrative of an Epidemic English Cholera that appeared on board ships of war lying in ordinary in the River Medway during the Summer and Autumn of 1831." *Edin. Med. Surg. Journ., Feb.* 1832, p. 295

[4] John Marshall, M.D., *Obs. on Cholera as it appeared at Port Glasgow in July and August*, 1831. *Illustrated by numerous cases.* 1831.

Asiatic Cholera at Sunderland in October, 1831.

In the end of July and in August, Sunderland and the adjoining villages and farms in the valley of the Wear were visited with "a very general prevalence of the indigenous cholera of the country, bearing in most instances its usual leading feature—that of excessive bilious discharges[1]." Few, who were not attacked with actual cholera nostras, were altogether free, it was said, from diarrhoea or disordered digestion. Many of the choleraic cases were unusually malignant, of which the following are instances:

Allison, aged fifty, a painter of earthenware residing in a low situation on the bank of the Wear two miles above the town, was attacked at 4 a.m. on the 5th of August with vomiting and purging of a watery whitish fluid, like oatmeal and water. His hands and feet were cold, his skin covered with clammy sweat, his face livid and the expression anxious, his eyes sunken, his lips blue, thirst excessive, his breath cold, his voice weak and husky, and his pulse almost imperceptible. He passed into a stage of reactive fever and got well. Arnott, a farm-labourer on the opposite bank of the Wear from the man Allison, was seized at 2 a.m. on the 8th August with precisely the same symptoms, and died in twelve hours. Neither he nor Allison had any intercourse or relation with seamen or the shipping of Sunderland[2]. Another case on the 8th of August came to light afterwards. A woman in the village of West Bolden, four miles from Sunderland, on the Newcastle road, was found by a surgeon from the town to be suffering from choleraic sickness, of which she died twelve hours from its onset[3].

A week after these cases in the country not far from Sunderland, there occurred the death, on 14 August, of one of the Wear pilots named Henry. He had been troubled with diarrhoea for some time before, but not so as to keep him from his occupation. Having gone down in the direction of Flamborough Head to look for ships, he picked up a vessel between that and the Wear, piloted her in, and, a few days after, piloted her out again. The identity of the vessel was never traced, but it was alleged that she had come from an infected port abroad. The last time Henry was in his boat he was seized with violent vomiting and purging, and died at his house after an illness of twenty hours. A brother pilot, who looked in at the house on the day of his death, fell into a similar choleraic disorder, but recovered[4]. On the 28th of August a shipwright died of the same; also about the end of August two persons at a distance of four or five miles from Sunderland. In September, it is said, there were other cases and fatalities. Early in October the authentic particulars of cholera in Sunderland begin. Dixon attended one case, which was fatal on the 9th October. Another case, which came to light three months after, was that of a girl of twelve, named Hazard, residing on the Fish Quay, who was well enough on Sunday the 16th October to have been twice at church. She was seized in the middle of the night following with the sudden and appalling symptoms of

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[1] William Dixon, *Lond. Med. Gaz.* 4 Feb. 1832, IX. 668.

[2] Dixon, u. s.

[3] Kell, p. 22.

[4] Kell, Dixon, and others; the statements about Henry's case are contradictory.

choleraic disease and died on the Monday afternoon[1]. A few doors off on the same quay lived a keelman named Sproat, aged sixty; he occupied a large, clean, well-ventilated room on the first-floor of a house in the most open part of the quay, opposite to a crowded part of the anchorage. He was in failing health, and had been troubled with diarrhoea for a week or ten days previous to the 19th October, on which day he had to give up work. Next day, Thursday, the 20th, a surgeon who had been sent for found him vomiting and purging, but not at all collapsed, with no thirst, and in good spirits. He improved so much that on Friday he had toasted cheese for supper and on Saturday a mutton chop for dinner, after which he went out to his keel on the river for a few minutes. On his return he was seized with rigor, cramps, vomiting and purging. Medical aid was not sent for until seven on Sunday morning, when he was found in a sinking state, pulseless, speaking in a husky whisper, his face livid and pinched, his limbs cramped, the purgings like "meal washings." He continued like that for three days, and died on Wednesday, the 26th October, at noon.

This came to be reckoned the first death from Asiatic cholera in England.

His grandchild, a girl of eleven, while moving about the room an hour after the death, was suddenly seized with faintness, pains in the stomach-region, vomiting and purging of watery matter: she was taken to the Infirmary and soon got well. The day after his father's death, Thursday, the 27th October, William Sproat, junior, a fine athletic young keelman, who had attended on his parent during his illness, was found lying in a low damp cellar near to the Fish Quay, suffering from choleraic symptoms; he had been ill only a few hours, and was removed (with his daughter as above) to the Infirmary the same evening. He became gradually worse: on the 30th he was continually throwing himself about, moaning and biting the bedclothes; on the 31st he was lying on his back comatose, his eyes open, the pupils wide and insensible, and the breathing stertorous, in which state he died the same day. An old nurse at the Infirmary (Turnbull) helped to place the body in the coffin, went to bed in a state of considerable fear, and was seized at one in the morning with symptoms of cholera, of which she died after a few hours.

Meanwhile there had been two other fatal cases unconnected with the Sproats or the Fish Quay. On the quay of Monk Wearmouth, across the river, lived a shoemaker named Rodenburg, aged thirty-five. He occupied a poor hovel and had a large family, but he was in good work and wages. On Sunday, the 30th October, he had pork for dinner, and what was left of it for supper. In the middle of the night he was seized with vomiting, and with purging of a fluid like water-gruel in vast quantities; when visited by the medical men, he spoke in a husky whisper, his nails were blue, his skin livid, covered by cold sweat, his limbs cramped. The spasms ceased about nine o'clock on Monday morning; about noon he asked to be raised in bed, and died as they were raising him. On the very same night, between Sunday and Monday, a keelman named Wilson, who lived with his wife in a decent room in the High Street, and had attended the Methodist chapel on Sunday, was seized with cholera at 4 a.m. on Monday, and died the same afternoon at three.

These six cases within a few days, all fatal but that of the girl of eleven, looked like the real Asiatic disease. Kell, an

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[1] Clanny, p. 19.

army assistant-surgeon stationed at Sunderland with the reserve companies of the 82nd Regiment, had suspected that the earlier case of the pilot Henry was true Asiatic cholera (which he had seen in Mauritius in 1829), and had written to the Board of Health. At a meeting of the faculty at the Infirmary on the morning after the admission of Sproat junior and his child (28th October), Kell urged upon them that the disease was Asiatic cholera, but all the twelve present, save Dr Clanny, who was in the chair, maintained that it was common indigenous cholera. However, when the younger Sproat died, and the nurse after him, and two others in different parts of the town, a full meeting of medical men at the Exchange came unanimously to the opinion that these were cases of "spasmodic cholera." A meeting of the Board of Health and leading citizens was at once held, who were informed that, in the unanimous opinion of the medical gentlemen of the town, "spasmodic cholera prevailed in Sunderland." The authorities in London having been kept informed (principally by Kell), a surgeon of Indian experience was sent down by the Board of Health on the 5th November, and a colonel by the lords of the Council on the 6th, to act as commissioners.

It happened that no more cases occurred for three days after the death of the nurse at the Infirmary; so that the doctors, like Pharaoh in the intervals between the plagues of Egypt, were beginning to repent of their diagnosis. The shipping trade of Sunderland was threatened by these newspaper alarms, and by the presence of two Government commissioners in the town; while Kell was demanding a ship of war off the mouth of the Wear, and a battery on shore, to make the quarantine respected. The Marquis of Londonderry, interested in the coal-trade, wrote to the *Standard* that the alarm was false. The magistrates, shipowners and leading residents, who had met on the 9th November to raise money for a cholera hospital, assembled again in various public meetings or caucuses on the 10th and 11th, and passed resolutions that there was no Indian or other foreign imported cholera in Sunderland, that it was a wicked and malicious falsehood to say there was, and that there was no need of quarantine on the Wear. One of these meetings was attended by fifteen medical men (most of them from the residential suburb of Bishop Wearmouth), who severally expressed the opinion in various terms, that the recent fatal cases were aggravated cases of English cholera, not contagious or infectious, while three more sent letters backing up Lord Londonderry and the shipowners. On the 12th of November, twenty-seven medical men signed a declaration to the same effect. Some of these remained unconvinced by the progress of events, Dixon arguing as late as 23 January, 1832, that the epidemic in Sunderland, which was by that time over, had been one of "spontaneous malignant cholera."

Two new seizures occurred on the 7th November, none on the 8th, seven on the 9th, one on the 10th, and so on for fully

six weeks longer until Christmas, when the cases became very occasional, so that on the 9th of January, 1832, Sunderland was declared by the Board of Health to be free of cholera. The largest number of seizures reported on one day was nineteen on the 8th of December; on the 10th of that month there were sixty-three cases under treatment at once; the whole number of cases from 23rd October to 31st December was 418, of which 202 were fatal; the whole deaths at Sunderland by the cholera of 1831–32 are given at 215, so that the epidemic exhausted itself there before it had well begun elsewhere in the country. The effect of it upon the death-rate is shown in a comparison of the burials for November and December in three successive years[1]:

Burials in the parish of Sunderland.

	November	December
1829	29	44
1830	39	76
1831	122	127

The way by which the virus entered Sunderland was never traced. It was known, however, that deaths from cholera had occurred among the crews of Sunderland ships lying at Cronstadt and Riga; and as it was the practice for vessels owned in Sunderland to come home from their summer trading towards the end of the season, so as to lay up during the winter, it was suspected that the clothes of some of the dead men had been brought over and sent ashore. The quarantine in the Wear was far from effective: the station was higher up the river than the loading moorings, so that suspected ships had to pass through a crowd of ordinary shipping to get to it. It appears that hardly any ships were quarantined, except some from Dutch ports where no cholera then existed.

This first experience of Asiatic cholera on British soil brought out very clearly one character of the infection which was seen to attend it everywhere during the following year, and has always attended it in every subsequent invasion of the disease. The virus, for all its opportunities, showed a marked preference for, an almost exclusive selection of the lowest and least cleanly localities, and a considerable preference for persons

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[1] A table of the daily course of the cholera at Sunderland, which I must omit for want of space, is given in the essay by Haslewood and Morbey, *History and Medical Treatment of Cholera as it appeared in Sunderland in* 1831, London, 1832, p. 151.

of drunken or negligent habits. Sunderland consisted of three parts—the parish so named, the parish of Bishop Wearmouth, which was the west end of Sunderland or the residential quarter of the wealthier class, and across the river the parish of Monk Wearmouth, with the adjoining Shore. The cholera was almost wholly confined to Sunderland proper; Ainsworth says that no cases occurred, to his knowledge, in the parish of Bishop Wearmouth, and not above six in Monk Wearmouth; another gave six or eight cases in each of these parishes, but increased the estimate to eighteen or twenty in each according to later information. Bishop Wearmouth stood about seventy feet higher than the highest part of Sunderland; it was well built, and its population of 14,462 (with 363 more in the Pans), included the whole of the wealthier class with the trades dependent on them. Monk Wearmouth, with a population of 1498, and the adjoining Shore with a population of 6051, were irregularly built on the north bank, and occupied by the same class (keelmen, sailors, labourers and workmen in the coal, iron and shipping trades) as Sunderland itself; but for some reason, connected perhaps with its soil and elevation, it escaped with a very few cases of cholera[1]. The parish of Sunderland, with a population of 18,916, was not all visited equally. The focus of the cholera, says Ainsworth, was the town moor, a large piece of pasture-land stretching to the sea-shore at the south-east end of the town, having a subsoil tenacious of water, marshy in the winter months, and its roads almost impassable. Upon this open space was deposited, and left to accumulate for weeks together, the filth from the narrow lanes and passages of the low-lying and crowded quarter at the seaward end of the parish, to the south of the High Street. Some of the streets occupied by the poorer class consisted of old residences of the well-to-do, now divided into tenements. Certain streets had as many as a dozen or twenty common middens, "let in" to the street fronts of houses and covered by trap-doors, in which the domestic refuse and sweepings of the street were collected as a source of profit, and sold at stated times to farmers for manure. Most of the attacks happened in this low-lying part of Sunderland, with a soil and foundations sodden with filth, houses overcrowded and badly ventilated, and its residents subject to the alternations

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[1] Kell, however, suspected that there were many malignant cases in Monk Wearmouth after the 31st of October, which were not reported. l. c. p. 73.

of excess and want (with much pawning of clothes, &c.) peculiar to a port from which one or two hundred sail would leave with a fair wind or arrive in the river together[1]. About four hundred were attacked in a population of eighteen thousand during a space of two months. The cases among the wealthier classes were nearly all in the households of medical men:—the mother of one doctor, living with him, died of Asiatic cholera, the wife of another came safely through an attack, one or more medical men had the symptoms in one degree or another. In the end of November, five old people in the poor's house were fatally attacked all at once, in different parts of the building. A cholera hospital had been provided at an early stage of the outbreak, but the relatives of those attacked seldom permitted their removal to it, a prejudice against it having been aroused by the post-mortem examination of the first victims. Most of the cases were accordingly treated at their homes, which were "always crowded to excess by the immediate attendants or relatives, and by others from mere curiosity." A fund of two thousand pounds was raised for the distressed families, to which the Government gave one hundred. Sunderland became for two or three weeks a centre of interest to medical men, who came to see the cholera from various parts of England, Ireland and Scotland, while MM. Magendie and Guillot came from Paris, and M. Dubuc from Rouen.

The symptoms and morbid anatomy of cholera as it was known in India were seen without ambiguity in the Sunderland epidemic. In a few cases death followed very quickly without the distinctive intestinal symptoms; but usually the unmistakeable thing was a sudden seizure, often in the night after a hearty supper, marked by profuse "meal-and-water" or "rice-and-water" purging, by vomiting, faintness or sinking at the pit of the stomach, thirst, pulselessness, cramps of the limbs, restless tossing, coldness, blueness and clamminess of the surface, and shrunken features. The *facies Hippocratica* had not been seen on so extensive a scale in England since the sweating sickness of

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[1] Clanny says (p. 42), "At first our epidemic appeared only in certain streets or lanes, namely, the Fish Landing, Long Bank, Silver Street, High Street, Burleigh Street, Mill Hill, Sailors' Alley, Love Lane, Wood Street, Warren Street; as also in several lanes in Bishopwearmouth, the New Town, Ayre's Quay, and on the north side of the river in Monkwearmouth, in several of the byelanes near the river... Generally speaking the disease fixed its residence in such places as medical men could have pointed out *à priori.*"

three hundred years before. The end was sometimes in deep coma, at other times in delirium with convulsive or spasmodic movements. The chief point in the morbid anatomy was the engorgement of the lungs, great veins, and right side of the heart, from which the disease was named "cholera asphyxia." The blood was thick and tarry[1].

Extension of Cholera to the Tyne, December, 1831.

Before Sunderland had been declared by the Board of Health to be free of cholera, on the 7th of January, 1832, the infection had gained a footing in Newcastle, Gateshead, North Shields, Houghton-le-Spring, and some places on the road to Edinburgh. The mildness of that winter was somewhat favourable to its diffusion; in November there had been some days of severe frost in the midst of generally mild weather, December was warmer than usual, the pastures being green and spring-like, while January was warm and dry almost beyond precedent. The first cases in new centres were usually tramps or others who had come from Sunderland[2]; but there were some puzzling attacks. Thus Dixon says that on 12th December, 1831, he visited a woman of fifty who died of cholera after twelve hours, "in a lonely district unconnected in situation with any previously infected place," and where there had been no personal liability to contagion; a young man lodging in the house died three days after with the same symptoms.

At Newcastle, as at Sunderland, fatal cases of choleraic disease were discovered from the beginning of autumn; one such, on 4 August, at the village of Team, two miles to the south-west of Newcastle, was said to have been as little of the nature of bilious cholera, and as truly spasmodic cholera, as those in the subsequent great epidemic. Another suspicious death occurred a little below Newcastle on the 26th October, the same day as the first acknowledged death from the Asiatic disease in Sunderland. A month passed before the next death, marked by spasmodic and non-bilious symptoms, occurred at Newcastle—on the 26th November.

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[1] Besides the essay of Haslewood and Morbey, and the paper by Dixon, *supra*, the following were written on the Sunderland cholera: W. Ainsworth, *Obs. on the Pestilential Cholera at Sunderland*, London, 1832; John Butler Kell, surgeon to the 82nd Regt., *Cholera at Sunderland in* 1831, Edin. 1834; W. Reid Clanny, M.D., (chairman of the Local Board of Health), *Hyperanthraxis, or the Cholera of Sunderland*, Lond. 1832; Emile Dubuc, *Rapport sur le Cholera Morbus à Sunderland, Newcastle, etc.* Rouen, 1832.

[2] Ainsworth, p. 164, u. s., says: "Dennis Mc Gwin, who took the disease to North Shields, came from Sunderland. The first case in South Shields was a boy from Gateshead. A pedler woman took it to Houghton, a traveller to Morpeth, and I have no doubt its arrival could similarly be traced to Durham, Haddington and Tranent, all towns on the same high road. A wanderer also perished of the disease at Doncaster; but luckily there were no other cases."

At length, on the 7th of December, 1831, the Asiatic cholera was declared to be in the town. The earliest cases of it were found in low-lying poor houses along the river[1]. Gateshead, on the south bank of the Tyne, had only two cases until a day or two before Christmas; at length, on Christmas-day, there was a sudden explosion of the infection simultaneously at many points.

> "On the 25th [December, 1831] about one o'clock," wrote Brady[2], "we were assailed by a third and fourth example of the disease, and before the next morning at ten o'clock, very considerable numbers had fallen sacrifices to its pestilential ravages. Within a space of twelve hours it spread itself over a diameter of two miles, and appeared to pay but very little distinction to altitude of situation, for the higher parts of the town were laid under its stroke in an equal degree, or nearly so, with the lower. Pipewellgate, Hillgate, the banks above Pipewellgate, Oakwellgate, the lanes leading from it, Jackson's chare, Nun's Lane, Wreckington, Gateshead Low Fell, Low Team—situations as different in their external character as can well be conceived—were all indiscriminately exposed to its fury."

Greenhow's summary of this remarkable explosion on the afternoon and night of Christmas-day is that "at nearly fifty different points cases occurred almost at the same instant." The attack at Gateshead was short and severe; at Newcastle it was less concentrated and of longer duration, affecting the population in the low and dissolute localities along the river, such as Sandgate and the Close, while there were two or three fatalities about the 6th January among the wealthier residents. The hospital cases in Newcastle and Gateshead to the 9th of February were:

	Cases	Deaths
Sandgate Hospital	55	23
Castle Hospital	12	8
St John's and St Andrew's	15	8
Gateshead Hospital	36	21
	118	60

As at Sunderland, the bulk of the cases were treated at their homes—1330 cases, with 437 deaths, to the 9th of February. As the whole number of deaths at Newcastle and Gateshead, while the cholera of 1832 lasted, was 801 in the returns to the Board of Health, it would appear that the epidemic had

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[1] T. M. Greenhow, M.D., *Cholera as it has recently appeared in the Towns of Newcastle and Gateshead, including Cases*, London, 1832; Thomas Mollison, M.D., *Remarks on the epidemic Disease called Cholera, as it occurred in Newcastle*, Edin. 1832. (He arrived at Newcastle from Edinburgh on the 21st Dec. and remained eleven days.)

[2] In Greenhow, u. s.

dragged on through the spring and perhaps the summer, which were its seasons elsewhere.

The colliers' villages on both sides of the Tyne for two or three miles above and below Newcastle and Gateshead were sharply visited at the same time. Below Newcastle, on the north bank, it invaded Dent's Hole, a dirty narrow lane along the margin of the river, overhung by its banks, filled with mud and filth rising in heaps above the thresholds of the houses; also on the same side, Walker, Howden-Pans, and so on to North Shields; on the south side below Gateshead it visited Felling and other villages. South Shields and Westoe escaped for several weeks, but at length about the 20th of February the epidemic began there and caused 147 deaths before it ceased.

Some of the worst village outbreaks occurred above Newcastle on both sides of the river. Swalwel, a low dirty village of iron-workers, near the confluence of the Derwent with the Tyne had a very virulent attack. Dunston, another low-lying village on the south bank, two miles above Gateshead, subject to inundation from the small tributary stream running through it, had twenty-three deaths among the 400 inhabitants in about a fortnight, most of the victims being old, dissipated and debilitated. On the other hand, Whickam Fell, standing on the hill between Dunston and Swalwel, escaped with only one case, while Bensham, another elevated village between Gateshead and Dunston, escaped altogether; just as Byker, a high-lying village on the north bank, only half a mile from Dent's Hole, had but a single mild case.

On the north bank above Newcastle the disease was most severe in the villages of Bell's Close, Lemington and Newburn. The epidemic in the last of these was indeed unparalleled. As in all the other villages attacked, the epidemic was soon over, but not before two-thirds of the inhabitants had suffered either from choleraic diarrhoea or cholera proper. Newburn was a village of some 131 houses, built in the face of the high north bank of the river five miles above Newcastle, its population being 550. The houses stood in two rows, one above the other, the church and churchyard standing in open ground midway between the lower and upper streets of the village; a small stream ran through it to the Tyne. The inhabitants were mostly wherrymen, coal labourers, or glassworkers; they were a healthy

community, above indigence, housed in clean, neat, comfortably furnished clay-floored cottages. The first case of cholera, in a man who lived close to the brook, proved fatal on the 4th of January, 1832. There was no new case until the 10th, after which there were several deaths every day. From the night of the 15th until noon of the 16th fifty were attacked, twelve or thirteen of them with the worst kind of spasmodic cholera, the rest with diarrhoea. By the 2nd of February the epidemic was over. Three hundred and twenty had either cholera or cholerine, of whom fifty-seven died (the Board of Health return gives 274 cases and 65 deaths to 25 January), the daily deaths having been as follows[1]:

Cholera in Newburn, near Newcastle, 1832.

	Deaths		Deaths
Jan. 4	1	Jan. 20	3
11	4	21	2
12	3	22	3
13	4	23	2
14	6	24	2
15	5	25	1
16	6	26	2
17	3	27	1
18	5	28	1
19	3	29	

The other chief centres of cholera in the northern coal district, besides those mentioned, were Houghton-le-Spring and Hetton (which had together 311 cases and 66 deaths to the 28 of January), the colliery village of Earsden, and the port of Tynemouth.

The Cholera of 1832 in Scotland.

It was not until April that the infection began to show itself on the same scale in other parts of England. The next parts of the kingdom to be invaded after the Wear and the Tyne were the coal and iron districts of East Lothian and Lanarkshire, the cities of Edinburgh and Glasgow becoming infected soon after. A fatal case, in a destitute tramping sailor occurred at Doncaster, in the beginning of January, but led to no outbreak; two fatal cases occurred at Morpeth about the same time, the second of the two in a bagman who had just spent three days making his rounds in Newcastle and the infected villages near

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[1] Craigie, *Edin. Med. Surg. Journ.* XXXVII. 337.

it. It was on the high road to Edinburgh, at Haddington, Tranent and Musselburgh, that the next focus of cholera was established. Previous to the 14th of January there had been 47 cases, with 18 deaths, in and near Haddington, among the miners and others of the labouring class. At Tranent, seven miles nearer Edinburgh on the main road, with a population of 1700 miners and labourers, a boy died of cholera on the 18th January, the infection spreading so rapidly that before the 25th there had been 61 attacks with 26 deaths, which rose to 205 attacks and 60 deaths by the 8th of February. A few cases occurred also at North Berwick and a good many at Preston Pans; while Musselburgh became the scene of one of the most deadly outbreaks in the whole history.

Musselburgh, with Fisherrow, was not then the place of villas which it afterwards became, but was occupied by a working class, who combined the three industries of coal-mining, weaving or other factory work, and fishing. To add to the ordinary insanitary risks of such a combination, some fifteen hundred hands had been out of work for two months, and were in "a state of great misery." The first case of cholera appeared there on Wednesday, the 18th January, three days after the first death at Tranent. The virulence and certainty of the infection will appear from the following by D. M. Moir, the distinguished author of *Mansie Waugh* and other writings in prose or verse, who practised his profession at Musselburgh:

> "A girl at Musselburgh, whose mother kept a lodging-house, was found in a state of complete collapse on the morning of Thursday, the 19th January —the day after the first appearance of the pestilence. She died on that afternoon, between five and six, and was buried by moonlight the same evening....The mother during the night of Saturday was also similarly seized, and fell a victim on the following noon. Her sister, who had walked from Leith on the same morning to condole with her in her family distress, was immediately affected on entering the house; but her symptoms being overlooked in the misery around her, medical assistance was not called in, until, on the return of the nieces from the interment, their aunt was discovered dead on the floor of the dwelling. Her husband, Baxter, a man of intemperate habits, came out to enquire into her fate; and immediately on his return home to Leith was seized with the distemper and died."

In three weeks there were more deaths from cholera than from all causes in the whole of an ordinary year. To the 22nd of February, just over a month from its outbreak, the disease had attacked 435, of whom 193 died. The medical profession (the senior of whom was a man of original talent, Thomas Brown,

author of an essay on smallpox, in 1808, and one on the Indian cholera in 1824), were greatly taxed by the numerous calls upon them: Moir met one night a young colleague who complained of feeling ill, and was advised by the former to go home at once; he continued his rounds for an hour longer, and died of cholera next morning. Edinburgh, only five miles distant, was in constant communication with Musselburgh; and at length three or four cases appeared in the city in persons who had been at the infected place. The Edinburgh cases, however, did not multiply rapidly; to the 8th of February, there had been 8 cases with four deaths; to the 28th of February, 35 cases, with 18 deaths; to the 20th of March, 39 cases, with 20 deaths. On the other hand, the suburb of Water of Leith, had 48 cases, with 23 deaths at the same date. On the 6th April, 1832, the figures for Edinburgh and certain of its suburbs respectively were:

	Cases	Deaths
Portobello	44	24
Water of Leith	58	30
Canonmills	18	12
Duddingston	10	3
Edinburgh	62	38

Of the border towns, Hawick was infected on the 14th January, probably from Morpeth, and had a not very extensive epidemic, of somewhat mild type[1]. Coldstream, on the Tweed, a few miles above Berwick, had 109 cases and 37 deaths to the 20th of March.

Meanwhile the infection had sought out the weak spots in the west of Scotland—the mining and weaving villages in Lanarkshire, the city of Glasgow and the manufacturing town of Paisley. On Sunday, the 22nd January, a boy was taken ill in church at Kirkintilloch (a village on the Forth and Clyde canal, seven miles north-east of Glasgow), and died next morning: that was the first case in the west of Scotland. Cases multiplied in Kirkintilloch, so that by the 6th of March there had been thirty-two deaths, but no more for the rest of the season. A few days after the boy was seized in church there, a first case occurred in the mining village of Coatbridge, six or seven miles to the south-east, in an old man living in a "back land" in very poor circumstances, who had not been

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[1] John Douglas, M.D., "History of the Epidemic Cholera of Hawick," in *Cholera Gazette*, no. 6, April 7, p. 234.

in Kirkintilloch nor had communication with such as had been there; other cases followed slowly, and at length there was a more severe outbreak.

Glasgow at once took precautions. A Board of Health had been formed there early in the summer of 1831. In February, it had command of £8000 raised by voluntary subscriptions, and it made provision of 236 cholera beds in five hospitals. The theatres were closed, and "evening sermons" discouraged; while all the passenger boats (for a time also the goods barges) on the Forth and Clyde canal, and on the Monkland canal (near to which was Coatbridge) were stopped. District committees were formed in all parts of the city.

The first victim was Janet Lindsay, a drunken old woman who lodged with widow Proudfoot and her daughter in Todd's Close, Goosedubs; she was asthmatic, and had not been beyond the Goosedubs for weeks. Her seizure, with vomiting and purging, was on the afternoon of Thursday, 9th February, and her death on Saturday morning. Also on the 9th February, in the suburb of Woodside, remote from Goosedubs, the infant of one McGie was attacked with cholera, suffered much from cramps on the 10th and died on the 11th, the father, mother and others of the family afterwards suffering from cholera. The third case, fatal in a few hours, appeared early in the morning of Friday the 10th in a boy living in Millroad Street, a mile east of the Goosedubs, who had been subject to diarrhoea for some weeks. The fourth victim was a gardener in Macalpine Street, a locality also remote from the Goosedubs and in the opposite direction from Millroad Street, who had walked three miles to Pollokshaws on the 9th, and had partaken of tea with friends at Crossmyloof on his way back, in excellent health: he was seized at midnight with purging, and died on the afternoon of the second day. The fifth case was in Partick on the 11th, the sixth in Bridgegate on the 12th, not far from the close in the Goosedubs where the first case had occurred. On the 17th the first of many cases occurred in Paisley, and on the same day there was a case at Maryhill (population of some 500), followed by six more before the next afternoon. Thus there were, besides the case of cholera in the very heart of old Glasgow, half-a-dozen other cases the same day or in the next day or two, at scattered points all round the city. About fifty of the neighbours had visited Janet Lindsay in Todd's Close, and some had helped to lay her out. The next case in the close was of a woman who had stopped in the street to talk with the widow Proudfoot shortly after the body had been removed; this woman was seized at seven next morning (Sunday, the 12th Feb.), and died in the hospital after twenty-four hours. Three days passed, and then there occurred two other cases, both fatal, in Todd's Close, one of them being the widow Proudfoot herself, who refused to be taken to the hospital, and would receive no other medicine or cordial but whisky. No other cases occurred in the close for several weeks; but within a range of two hundred yards of it there were 46 cases from the 13th to the 29th of February. It was, indeed to this region of Glasgow, the Goosedubs and the Wynds, that the infection was chiefly confined for the first few weeks; it was especially severe in Francis's Close, Broomielaw, a collection of small wretched hovels, in which some twenty died of cholera[1]. The state of the

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[1] Chiefly from the paper by Professor George Watt, *Glas. Med. Journ.* v. 298, 384; see also Bryce, *ibid.* 262.

three old Wynds of Glasgow and of other the like localities has been already referred to under a date a year or two before the outbreak of cholera (supra p. 598).

No better instance could be given of the inscrutable ways in which the infection of cholera found out the weak places and the likely subjects than the explosion in the Glasgow Town's Hospital or pauper infirmary on the 22nd of February, some twelve days after the first cases in various parts of the city and suburbs.

The infirmary, built in two blocks on the north bank of the Clyde, contained 395 inmates occupying 296 beds, some 60 or 70 of whom were insane or fatuous. The fatuous lived in ground-floor cells of the north block, from seven to eleven feet square, with a stone vaulted roof, a stone floor, no fireplace, damp from situation and want of sun, but all the more damp from being often washed owing to the uncleanly habits of the inmates. At eight on the morning of the 22nd February two fatuous paupers in adjoining cells were found cold and pulseless; they had vomited and purged during the night, although they had been well the evening before; each of the two cells had three beds with five occupants. One of the two seized died next day, the other recovered in a week, having had severe spasms and a degree of collapse. Cases appeared almost at the same time in various parts of the building, most of them in scattered individuals, but in one instance in as many as five together in a garret holding twenty-two. From the 22nd February to the 9th of March there were 64 attacks of cholera in this pauper institution[1]. Besides the five deaths in the Sunderland Workhouse, this was the first of many instances of the remarkable invasion of such institutions.

Until July the infection had been limited in Glasgow to certain of the lowest localities, and even in these it had declined almost to extinction in the last week of May. As the summer advanced it increased somewhat again, and in the first days of August it took a sudden start, reaching a maximum of 181 attacks in one day, and 817 in a week. It was no longer confined to the poorest districts, but became diffused all over Glasgow, so that "there was scarcely a street where one or more cases did not occur." From this enormous prevalence in August, it declined again in September, but once more took a start in the last few days of that month and in the first week or two of October. The last outburst was ascribed to the effects of the Glasgow public holiday on 28 September, to celebrate the passing of the Reform Bill for Scotland, but the course of the epidemic clearly followed the season, being precisely parallel in Edinburgh, in Dumfries and in the coast towns of Fife. From

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[1] W. Auchincloss, M.D., "Report of the Epidemic Cholera as it appeared in the Town's Hospital of Glasgow in February and March, 1832," *Glas. Med. Journ.* v. 113.

the middle of October, the disease declined rapidly and was extinct before the middle of November. The following table shows week by week the number of new cases reported daily to the Board of Health, and the deaths in each week[1].

Cholera in Glasgow, 1832 (*population* 202,426).

Week ending	New cases	Deaths	Week ending	New cases	Deaths	Week ending	New cases	Deaths
Feb. 19	62	21	May 20	41	31	Aug. 19	483	228
26	113	46	27	21	11	26	419	178
Mar. 4	68	39	June 3	6	7	Sept. 2	231	122
11	85	60	10	45	17	9	117	50
18	94	50	17	72	39	16	60	31
25	150	61	24	168	70	23	84	33
April 1	138	74	July 1	127	72	30	165	90
8	112	57	8	131	62	Oct. 7	310	140
15	99	50	15	143	68	14	173	95
22	120	60	22	229	101	21	95	58
29	71	40	29	218	113	28	47	29
May 6	71	39	Aug. 5	817	356	Nov. 4	41	18
13	73	39	12	699	339	11	10	11
						Total	6208	3005

The effect of the epidemic upon the general mortality of Glasgow is shown in the table of deaths from all causes and from cholera month by month, compiled from the burial registers, which make the cholera deaths 161 more than the returns to the Board of Health.

Glasgow Mortality in 1832.

	All deaths	Cholera deaths		All deaths	Cholera deaths
Jan.	824	—	July	990	441
Feb.	874	87	Aug.	1755	1222
March	955	264	Sept.	749	243
April	816	229	Oct.	755	334
May	677	125	Nov.	529	25
June	783	196	Dec.	571	—
				10,278	3166

While the cholera lasted (12 Feb.–11 Nov.) the burials from all other or ordinary causes were 4958; in the corresponding nine months of 1831 they were 4862, having been excessive in that year owing to fever. The baptisms from 15 December, 1831, to 14 December, 1832, were 3388; so that the cholera alone destroyed nearly as many lives, chiefly adult, as there were children born in the year.

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[1] James Cleland, LL.D., and James Corkindale, M.D., *Edin. Med. Surg. Journ.* XXXIX. 503.

Upwards of a thousand of the cases were treated at the Albion Street Hospital, under the direction of Dr Lawrie, who had had a large experience of cholera in India. His statistics are as follows[1]:

Albion Street Cholera Hospital, Glasgow, Feb.—Sept. 1832.

Males		Females		Both sexes		Percentages of deaths
Cases	Deaths	Cases	Deaths	Cases	Deaths	
370	251	662	419	1032	670	64·9

Ages	Cases	Deaths	Percentage of deaths
0—7	43	25	58·1
7—20	93	47	50·5
20—30	231	112	48·8
30—40	211	137	64·9
40—50	204	136	66·1
50—60	116	95	81·0
Over 60	134	120	89·5

Monthly Cases and Deaths.

	Cases	Deaths	Percentages of deaths
Feb.	40	33	82·5
March	97	69	71·1
April	122	81	66·3
May	56	40	71·4
June	126	94	74·5
July	240	143	59·5
Aug.	273	176	64·4
Sept.	64	33	51·5

The noteworthy points are: first, the great excess of women admitted, which was observed also at Edinburgh; secondly, the higher rate of fatality at the two extremes of life, which is the rule in some other infections; and thirdly, the lower ratio of deaths to cases during the height of the epidemic in the end of summer, which is explained, as Craigie remarked for Edinburgh, simply by the fact that the infection was no longer in the worst localities, but was attacking "a greater number of persons, and consequently much better constitutions."

The Glasgow cholera of 1832 was far more destructive than that of Edinburgh per head of the population, according to the following:

	Glasgow	Edinburgh
Population	202,426	136,301
Attacks of Cholera	6208	1886
Deaths by Cholera	3005	1065

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[1] J. Adair Lawrie, M.D., "Report of the Albion Street Cholera Hospital." *Glas. Med. Journ.* V. 309, 416.

The fluctuations of the epidemic in the two cities were closely parallel. In Edinburgh from the middle of February to the middle of June the new cases usually ranged from five to ten or fifteen a day, with an occasional excess, as on the 29th of April when there were twenty-six persons seized. As in Glasgow, there was a marked lull in the end of May and beginning of June, after which the seizures became more common and remained somewhat steady to the end of July, some days having as many as twenty attacks. The largest number in one day in August was nineteen, the September maximum sixteen (on the 28th). Edinburgh thus missed the enormous outburst that Glasgow had in August, while the September experiences were much the same in the two cities. The first week of October, which was the time of a second maximum in Glasgow (far below that of August), was the worst time of the whole epidemic in Edinburgh, the cases coming from all parts of the city, as in Glasgow they had done in August.

Successive days of most extensive Cholera in Edinburgh, 1832.

	New cases		New cases
Oct. 1	22	Oct. 6	30
2	23	7	27
3	44	8	18
4	45	9	13
5	23	10	26

This gives 214 cases in the week ending 7th October, as compared with Glasgow's 310 in the same week.

At the Castle Hill Cholera Hospital, 318 were admitted and 187 died. The ages, with the rates of fatality at each age-period, agree closely with those already given for the chief hospital in Glasgow. The smaller ratio of hospital fatality in the second half of the epidemic was perhaps more marked in Edinburgh: 119 cases, with 85 deaths, from the opening of the hospital to 5 July; 199 cases, with 97 deaths, from 5 July to the closing of the hospital. That larger proportion of recoveries may have been due in part, Craigie thinks, to better methods of treatment; but, in his opinion, it was mainly owing to the greater number of strong constitutions among those attacked over a wider area of the city.

Beyond the statistics and other particulars for Glasgow and Edinburgh, and the minute accounts of the first outbreaks in the beginning of the year, there is little exactly recorded of the

cholera of 1832 in the rest of Scotland; but the following table, compiled according to counties from the alphabetical list of the London Board of Health, will serve to show the epidemic in outline.

Deaths by Asiatic Cholera in Scotland, 1832.

Counties	Deaths	No. of places attacked	Places with highest mortalities in each county
Caithness	96	iii	Wick 69, Thurso 26, Latheron 1
Sutherland	—	—	
Ross and Cromarty	102	vii	Tain 55, Dingwall 17, Avoch 12, Cromarty 11, Several villages no return
Inverness-shire	191	iii	Inverness 177
Nairnshire	5	i	Nairn 5
Moray	—	—	
Banffshire	15	i	Rathven (Buckie) 15
Aberdeenshire	108	ii	Aberdeen and Footdee 99, Collieston 9
Kincardine	—	—	
Forfarshire	552	iv	Dundee 512, Cupar Angus 17, Arbroath 13, Liff and Benvie 10
Perthshire	81	v	Perth 66, Auchterarder 7, Kenmore 4, Tulliallan 3
Fife and Kinross	301	xii	Cupar and district 108, Kirkaldy and Dunnikier 104, Dysart 39, Wester Wemyss 17, Kinghorn 15, Burntisland 13, Anstruther 10, Leven 14, St Andrews 5
East Lothian	213	vii	Tranent 78, Haddington 65, Dunbar etc. 38, Prestonpans 28
Berwickshire	41		Coldstream 41
Midlothian	1780	xiii	Edinburgh 1065, Suburbs of, 146, Leith 267, Musselburgh and Fisherrow 202, Newhaven 52, Portobello 33
Linlithgowshire	—	—	
Clackmannanshire	75	i	Clackmannan 75
Stirlingshire	247	x	Alloa 72, Stirling 35, Falkirk 36, Larbert 31, Balfron 28, St Ninian's 15, Bothkenner 10, Carriden 13, Grangemouth 8
Lanarkshire	3575	xii	Glasgow 3005, Pollokshaws 143, Govan 77, Old Monkland 125, Rutherglen 65
Renfrewshire	1001	xi	Paisley 444, Greenock 436, Port Glasgow 69
Dumbartonshire	86	iii	Dumbarton 67, Bonhill 13, Helensburgh 6
Bute	14	i	Rothesay 14
Argyle	35	ii	Inverary 25, Campbelltown 10
Ayrshire	466	x	Kilmarnock 205, Ayr 190, Dalry 22, Irvine 19
Kirkcudbrightshire	133	iv	Troqueer (Maxwelltown) 125, Kirkcudbright 3
Dumfriesshire	441	v	Dumfries 418, Caerlaverock 15
Roxburghshire	34	i	Hawick 34 (second outbreak only).

Near Glasgow numerous centres of cholera were established, among which Paisley, Greenock and Dumbarton suffered heavily during the same space as Glasgow, from February to November. Rothesay, Campbelltown and Inverary had epidemics in spring or early summer. In June and July the infection was carried effectually into Ayrshire (an earlier importation to Doura, near Kilwinning, in March, having proved abortive) and caused great

mortalities at Kilmarnock[1] and Ayr[2], as well as much alarm and a good many deaths at Dalry, Irvine and Loudoun. In the latter half of September a most disastrous outbreak began in Dumfries and in the neighbouring Maxwelltown[3].

The epidemic in Leith and Newhaven proceeded at the same time as in Edinburgh. Another important centre was the midland coal-field of Stirlingshire and Lanarkshire, where the mortality was mostly autumnal. Perth had been reached early in March, Dundee at the end of April, the latter having a visitation on the same scale as Glasgow, Edinburgh, Paisley and Greenock. From Dundee, Cupar Fife was infected about the middle of August, and had a severe epidemic almost confined to paupers[4]. In the autumn there was much cholera among the fishing population from Thurso to Dunbar and Berwick. Inverness had been infected early in May, and was probably the centre from which the disease spread in the end of summer, during the herring fishery, to the coast towns and fishing villages, as well as to Tain and Dingwall. Only a few of these places made returns to the Board of Health; but it is probable from what Hugh Miller relates of the villages near Cromarty that the disease had been more widely spread. That author has described the condition of things in his native town. Its landlocked bay had been made a quarantine station, and was full of shipping flying the yellow flag. Cholera had "more than decimated" the villages of Portmahomak and Inver, and was prevalent in the parishes of Nigg and Urquhart, with the towns of Inverness, Nairn, Avoch, Dingwall and Rosemarkie. The numerous dead at Inver were buried in the sand, infected cottages had been burned down, the infected hamlets of Hilton and Balintore had been shut off from the neighbouring country by a cordon[5]. The citizens of Cromarty, hitherto untouched, followed the advice of Miller at a public meeting and took the law into their own hands, guarding all the approaches to their peninsula and subjecting

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[1] *Month. Journ. Med. Sc.* March, 1850, p. 302.

[2] Wood, *Glas. Med. Journ.* VI. 1833.

[3] Grieve, *Month. Journ. Med. Sc.* IX. 1849, p. 777.

[4] Scott, *Edin. Med. and Surg. Journ.* XXXIX. 276. For a whole month it was confined to one suburb. All the earlier cases were without exception fatal. There were 130 cases and 65 deaths.

[5] It is probably to Portmahomak or Inver that Howison refers in the following (*Lancet*, 10 Nov. 1832, p. 203): Cholera broke out in a small village several miles from Tain, and in a few days it carried off 41 out of a population of 120 to 140. Coffins could not be made fast enough. Many were buried in sailcloth. The people fled from their houses to the fields.

all arrivals to fumigation with sulphur and to some undescribed application of chloride of lime. The infection, however, got in by an unguarded channel. A Cromarty fisherman had died of cholera at Wick; his clothes had been ordered to be burned, but a brother of the dead man, who was in Wick at the time, secured some of them and brought them home. He kept them in his chest for a month before he ventured to open it. Next day he was seized with cholera and died in two days. Thereafter the disease crept about the streets and lanes for weeks, striking down both the hale and the worn-out. Pitch and tar were kept burning during the night at the openings of the infected lanes; the clothes of the dead were burned; many of the fishers left their cottages and lived in the caves on the hill until the danger was past[1].

Among the numerous fishing villages of the Moray Firth, Buckie is the only one given as severely touched by the infection (fifteen deaths). Only one small village of the Aberdeenshire coast, Collieston, is known to have had cholera (nine deaths)[2]. The Aberdeen epidemic was not severe, and appears to have been mostly in the fishers' quarter. The Montrose district escaped altogether in 1832; but in June, 1833, the true Asiatic cholera broke out in the fishing villages of Ferryden and Boddin, on the opposite shore of the South Esk from Montrose. Arbroath had a few deaths in August, 1832, while several of the small towns on the coast of Fife had from that time to the end of the year visitations which were only less alarming than those on the south side of the Firth of Forth at the beginning of the year. To sum up the epidemic in Scotland, it caused nearly ten thousand deaths, of which Glasgow and its suburbs had about one-third, Edinburgh, Leith, Dundee, Greenock, Paisley and Dumfries, another third, while a large part of the remainder occurred among the mining and fishing populations[3].

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[1] Hugh Miller, *My Schools and Schoolmasters*, Chap. XXII.

[2] The good account by Paterson, "Observations on Cholera as it appeared at Collieston and Footdee," *Edin. Med. and Surg. Journ.* XLIX. (1838), p. 408, shows how much panic a mortality of nine stood for.

[3] Sir J. Y. Simpson gave to Dr Graves of Dublin a list of some places in Scotland where cholera had appeared, which contains the additional names of Helmsdale (23 July), Fort William (24 Sept.), Fort George (7 May), Islay (23 Oct.), Portpatrick (7 Aug.), Crieff (2 Oct.), and Kelso (29 Oct.).

The Cholera of 1832 in Ireland.

The forecast of Orton in the summer of 1831, that Ireland would be the chosen soil of the Asiatic pestilence owing to the state of misery, at that time, of the mass of its people, was realized in a measure. But the cholera in Ireland, as elsewhere in Europe, showed itself chiefly as an urban disease, falling disastrously upon the poorest quarters of Dublin, Limerick, Cork, Galway, Sligo, Drogheda and other towns, but by no means seriously upon the immense population who occupied the country cabins. Scotland, indeed, had a higher ratio of cholera deaths than Ireland per head of the population; whereas Dublin had nearly twice as many deaths as Glasgow, their populations being almost exactly equal (about 200,000), and Cork had nearly the same number as Liverpool. The following table gives the comparison of the three divisions of the United Kingdom, including the cholera deaths of 1831 in England, but not those of 1833, which were more numerous in Ireland than elsewhere.

	Population in 1831	Cholera deaths
England and Wales	13,897,187	21,882
Ireland	7,784,539	20,070
Scotland	2,365,114	9592

The first undoubted case of Asiatic cholera was found in Dublin on 22 March, 1832. On the 25th of that month, Harty, who was physician to all the Dublin prisons, notified to the Board of Health cases in the Richmond Bridewell which he believed to be true spasmodic or malignant cholera[1]. It was reported from Cork on the 12th of April, from Belfast on the 14th, Tralee on the 28th, Galway on the 12th of May, Limerick on the 14th, Tuam the 4th of June, Waterford the 1st of July, but not until 21 August from Wexford and about the same time from Londonderry. Doubtless remoteness from the ordinary routes of vagrants was the reason why the infection was later in some places, such as Wexford. The old Liberties of Dublin, which harboured crowds of beggars in dilapidated tenement-houses, became a focus of virulent infection. As the summer advanced whole families in some of the most wretched lanes were cut off; news from Dublin on 29 June says that the pestilence was worst in Sycamore Alley, in a single house of

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[1] *Dubl. Journ. Med. Sc.* III. 74.

which twenty persons had died in the course of four or five days[1]. Certain streets sent fifty patients to the Cholera Hospital for one sent by other streets that were seemingly no better off[2]. The great hospital in Grange Gorman Lane, capable of holding 700 and sometimes occupied by 500, would on some nights or early mornings (from midnight to 7 a.m.) receive forty or fifty new cases, and within a week would be having at the same hours only two applications. During four successive days it admitted a total of 285 cases, during the next four days 497 cases, and during four days a fortnight later only 134 cases. The worst time was from the 10th to the 14th of July, when 615 were admitted. A day or two of rain seemed always to send up the number of cases carried to the hospital[3]. Until the beginning of June hardly anyone under fifteen was attacked: but in July the attacks of children were about one in thirteen or fourteen of adults, a case of pure cholera having been observed in an infant three weeks old. As at Glasgow and Edinburgh, more women than men were taken to the hospital (138·17 females to 100 males)[4].

As the infection spread in Dublin during the early summer a panic arose in the city, and alarm over the whole province of Leinster. Runners, as in the old times of the torch of war, were to be seen hurrying everywhere through the neighbouring counties carrying a smouldering peat, of which they left a small portion at every cabin in their direct line, with a sacred obligation upon the inmates to carry the charm to seven other houses, and the following exhortation: "The plague has broken out; take this, and while it burns offer up seven paters, three aves, and a credo in the name of God and the holy St John that the plague may be stopped"! Men, women and children scoured the country with the charmed turf in every direction, "each endeavouring to be foremost in finding unserved houses." One man in the Bog of Allen had to run thirty miles before he had discharged the obligation laid upon him[5]. It does not appear, however, that the infection was at all general among the

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[1] *Times*, 1 July, 1832.

[2] Simon McCoy, "Notes on Malignant Cholera as it appeared in Dublin," *Dub. Journ. Med. Sc.* II. 357, and III. 1.

[3] Compare Grimshaw's observations on the admissions for fever to the Cork Street Hospital in the summer of 1864, *supra*, p. 298.

[4] Wilde, *Census of Ireland* 1841. Table of Deaths, p. xxi.

[5] *Gent. Magaz.* 1832, June, p. 555; *Annual Register*, 1832, Chronicle (June), p. 71.

scattered cabins, hamlets or even considerable villages. In the rural parts of Wicklow there were only eight deaths from it, in Fermanagh four, in county Derry three, in Armagh thirteen, in Carlow none until the next year. In Clare the deaths in country districts were more than twice as many as in Ennis and other towns of the county. In Sligo county, again, there were only 62 deaths among the peasantry to 698 in the towns, nearly the whole of the latter total belonging to the county town and seaport. The epidemic in Sligo town was one of the worst in Ireland. It was reported that forty or fifty were buried in one day in a trench, one-half of them without coffins but wrapped in tarred sailcloth. It is said, also, that seven of the medical men died of cholera in the course of three months[1]. Thousands of the population, which numbered about 14,000, fled from the town, the wealthier paying large sums for a room or two in a country cottage, the poorer living in tents or sleeping under the hedges. In August the guard of the mail coach which ran from Sligo by way of Strabane to Londonderry was taken with cholera on the road and died at the latter town, no case having occurred in Londonderry up to that time[2].

The outbreak at Drogheda was as sudden and disastrous as at Sligo. At Belfast also the disease began with enormous fatality, but, according to the table, the deaths eventually were few in proportion to the attacks. The other towns which had highest mortalities were Cork, Limerick, Galway and Kilkenny —all seaports except the last. In Waterford the great outbreak was delayed until 1833.

Many of the counties had more deaths among the peasantry in 1833 than in 1832, Limerick county in particular. The following instance is related of a small hamlet about a mile to the south-east of Armagh:

> The hamlet consisted of five or six dwellings on both sides of the road. On the 19th July, 1833, a man in delicate health, who had received a jar of sea-water two days before, and had drunk three or four pints of it, was seized with cramps, and blueness and collapse, after the purging induced by the sea-water; he died on the 20th and was buried on the 21st. His brother, who lived next door under the same roof, was seized with cholera on the evening of the 21st, having attended the funeral, and died comatose after five or six days' illness. A man who lived across the road, and had also been

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[1] Graves, *Dubl. Quart. Journ. Med. Sc.* Feb. 1849, p. 31, from information by Dr Little of Sligo.

[2] W. Howison, M.D., of Edinburgh, *Lancet*, 10 Nov. 1832, p. 203. He was at Londonderry in August, and had probably heard the reports of the Sligo cholera there.

at the funeral of No. 1, was seized with cholera the same evening (21st), and died in forty-eight hours. On the night of his burial his son aged thirteen and a married daughter who lived in the house were seized, the boy dying the same night "very black," and the daughter after a lingering illness of five or six days. The only other attacked was a girl, who recovered under treatment by bleeding &c.[1]

In 1833 the whole number of deaths assigned to cholera in country places was 2,756, while 2,552 deaths were reported from the towns. It appears to be accepted (by Wilde) that true Asiatic cholera lingered in Ireland until 1834, and that it had caused a considerable part of the 4,419 deaths assigned to "cholera" under that year in the Census of 1841. There is one reference to undoubted cases of the Asiatic type in 1834 in Ross, Nenagh and other places in the same district[2].

Assuming that all the deaths so called in the three years 1832, 1833 and 1834 were true Asiatic cholera, that imported infection accounted for 1 in 5·68 deaths from all causes in Munster, 1 in 5·98 in Leinster, 1 in 9·86 in Connaught and 1 in 15·15 in Ulster. The proportion of attacks to fatalities in eight of the principal towns in the following table varies much, Belfast having comparatively few deaths for all its many cases, and Kilkenny three deaths to about five cases: these differences must have depended upon the number of cases of "cholerine" or diarrhoea which attended the true "spasmodic" or collapse-cholera, and may or may not have been counted in the returns.

Deaths from Asiatic Cholera in Ireland, 1832–33.

	1832		1833		
	Country deaths	Town deaths	Country deaths	Town deaths	No. of places with Cholera
LEINSTER					
Carlow	—	—	64	116	vi
Dublin	460	187	32	17	xxiv
Dublin City	—	5632	—	166	
Kildare	108	72	55	104	xi
Kilkenny	91	14	130	29	ix
Kilkenny City	—	296	—	144	
King's	40	288	10	—	v
Longford	22	63	—	—	iii
Louth	115	189	—	—	viii
Meath	61	105	81	113	vii
Drogheda Town	—	491	—	—	
Queen's	17	111	16	—	iv
Westmeath	18	121	84	5	iv
Wexford	126	362	24	150	v
Wicklow	8	40	—	23	iv

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[1] John Colvan, M.D., *Dubl. Journ. Med. Sc.* IV. 186. These five deaths in Armagh County in 1833 do not appear in the table.

[2] Graves, n.s. 1849, VII. 246.

	1832		1833		
	Country deaths	Town deaths	Country deaths	Town deaths	No. of places with Cholera
MUNSTER					
Clare	453	281	166	8	xiii
Cork	325	1028	466	240	xxxv
Cork City	—	1385	—	234	
Kerry	87	440	109	181	viii
Limerick	82	4	668	173	xvi
Limerick City	—	1105	—	—	
Tipperary	198	910	224	208	xii
Waterford	52	52	48	79	ix
Waterford City	—	24	—	245	
ULSTER					
Antrim	70	66	—	75	v
Belfast Town	—	418	—	—	
Armagh	13	57	2	—	vi
Cavan	21	11	70	51	vi
Donegal	37	139	141	—	vii
Down	110	423	65	37	xiv
Fermanagh	4	50	—	9	iv
Londonderry	3	222	—	—	iv
Monaghan	64	50	13	43	iv
Tyrone	100	193	17	9	ix
CONNAUGHT					
Galway	141	430	82	—	xii
Galway Town	—	596	—	—	
Leitrim	1	—	101	—	vi
Mayo	151	325	12	68	xi
Roscommon	47	105	38	25	vii
Sligo	62	698	25	—	iv

The Cholera of 1832 in England.

The certainty that Asiatic cholera was at Sunderland in November and at Newcastle in December, 1831, led to quarantine of ships arriving in the Thames from the Wear and the Tyne. The early numbers of the 'Cholera Gazette' published lists of vessels from these northern coal ports detained at Stangate Creek on the Medway[1]. At length about the middle of February, 1832, three suspicious cases occurred together in Rotherhithe, one of them being of a man who had been scraping the bottom of a Sunderland vessel. Other cases came close upon these in the parishes on both sides of the Thames from Rotherhithe and Limehouse to Lambeth and Chelsea, especially in the Southwark parishes.

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[1] Roupell, *Croomian Lectures on Cholera*, Lond. 1833, p. 33, gives the suspicious case of a man named Webster, who sailed from Sunderland on 20 Jan. and arrived in the Thames about the 30th. "The vessel immediately obtained *pratique;* but a few days after, this man was seized with extreme pain in the epigastrium" &c. and died suddenly after symptoms in part those of cholera. Postmortem, 20 oz. of blood were found in the peritoneum, and some blood in the lower part of the bowel.

The diagnosis of Asiatic cholera was vehemently contested for several weeks by a section of the profession, who frequented the Westminster Medical Society and had for their organ the 'London Medical and Surgical Journal.' The slow progres of the disease at first, and the apparent extinction of it for a week or two at the end of May (as at Glasgow and elsewhere in Scotland in the same weeks) encouraged these doubts, although the 994 fatalities in 1848 cases from 14 February to 15 May were quite unlike any experience of cholera nostras. After the riverside parishes, cases were reported most from other crowded parts, such as St Giles's in the Fields. From the middle of June the infection became more severe and widely spread, still making the river-side parishes its chief seat, but extending beyond Southwark on one side, and on the north side to such localities as Fetter Lane, Field Lane and parts of the City. From the 15th of June to the 31st October the cases in London were 9142 and the deaths 4266; in November and December only thirty more cases were known, of which one half were fatal. The total for the year in London came to 11,020 cases with 5275 deaths. This was admitted to have been for Asiatic cholera a slight and partial visitation of the metropolis. London with a population of a million and a half had actually fewer deaths than Dublin with its two hundred thousand inhabitants. Paris had more cholera deaths in one week of April (5523 deaths, April 8—14) than London had in all the year.

The Asiatic Cholera of 1831–32 *in England.*

	Deaths	No. of places attacked	Places with highest mortalities in each county
London	5275		
Surrey, part of	—	—	
Kent	135	xi	Minster (Sheerness) 38
Sussex	—	—	
Hampshire	91	ii	Portsmouth 86, *Southampton no return*
Berkshire	52	iv	Wantage 27
Middlesex, part of	62	iv	Uxbridge 34, Edmonton 11
Buckinghamshire	105	iv	Aylesbury 60, Olney 22
Oxfordshire	219	xii	Oxford 86, Bicester 64
Northamptonshire	—	—	
Huntingdonshire	45	iii	Fenstanton 21, Ramsey 20, St Ives 4
Bedfordshire	40	ii	Bedford 36
Cambridgeshire	208	iv	Whittlesea 97, Ely 61, Wisbech 41
Essex	38	iv	Barking 18, Chelmsford 10
Suffolk	1	i	Woodbridge 1
Norfolk	232	vi	Norwich 129, Lynn 49, Denver 27, *Yarmouth no return*

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Norfolk	232	vi	Norwich 129, Lynn 49; Denver 27, *Yarmouth no return*

	Deaths	No. of places attacked	Places with highest mortalities in each county
Wiltshire	14	ii	Chippenham 9, Farley 5, *Salisbury no return*
Dorset	19	ii	Bridport 16, Charmouth 3
Devon	1901	xxvii	Plymouth 702, Devonport 228, East Stonehouse 133, Exeter 386
Cornwall	308	xi	St Paul 81, Penzance 64
Somerset	142	v	Paulton 66, Bath 49, Tiverton 23
Gloucestershire	932	viii	Bristol 630, Clifton 64, Gloucester 123, Tewkesbury 76, Upton 34
Herefordshire	—	—	
Shropshire	158	vii	Shrewsbury 75, Oldbury 37, Madeley 27
Staffordshire	1870	xiv	Bilston 693, Tipton 281, Sedgley 231, Wolverhampton 193, King's Winsford 83, Wednesbury 78, Walsall 77, Newcastle-u.-Lyme 60, W. Bromwich 59, Darlaston 57, Stoke 46
Worcestershire	579	xi	Dudley 77, Worcester 79, Kidderminster 67, Droitwich 63, Redditch 38
Warwickshire	188	xii	Nuneaton 56, Coleshill 32, Birmingham 21
Leicestershire	5	i	Castle Donington 5
Rutland	—	—	
Lincolnshire	80	viii	Gainsborough 41, Owston 17
Nottinghamshire	352	vii	Nottingham and suburbs 322, Newark 25
Derbyshire	16	i	Derby 16
Cheshire	111	vi	Northwich 30, Stockport 29, Runcorn 18, Nantwich 14, Chester 14, Brimmington 6
Lancashire	2835	xiv	Liverpool 1523, Manchester 706, Salford 216, Warrington 168, Lancaster 114, Wigan 30
West Riding, York	1416	xxvii	Leeds 702, Sheffield 402, Hull 300, York 185, Wakefield 62, Rotherham 34, Selby 32, Goole 36, Bradford 30, Whitby 27, Doncaster 26
East Riding, York	507	iiii	
North Riding, York	47	ii	
Durham	850	viii	Sunderland 215, Gateshead 148, S. Shields 147, Stockton 126, Jarrow and Hebburn 70, Hetton &c. 97
Northumberland	1394	xiv	Newcastle 801, Villages near 259, N. Shields &c. 98, Berwick 84, Tweedmouth 72, Blyth 42
Cumberland	702	vii	Carlisle 265, Whitehaven 244, Workington 119, Maryport 42, Cockermouth 25, Allonby 4
Westmoreland	68	i	Kendal 68
Monmouth	15	ii	Newport 13, Abergavenny 2
South Wales	343	vii	Merthyr Tydvil 160, Swansea 152, Haverfordwest 16
North Wales	140	viii	Denbigh 47, Carnarvon 30, Flint 18, Newtown 17
Isle of Man	146	i	Douglas 146

It will appear from the annexed table (here compiled according to counties for the first time) that the cholera of 1832 visited most parts of England. The dates of outbreak at each place (omitted in the table) show that its great seasons everywhere, except at Sunderland, Newcastle and Musselburgh, were the summer and autumn. New centres or foci of infection were made in all directions, and in a good many small places there were epidemics which produced much alarm although the figures look insignificant in the statistical table. Some counties, such as Leicestershire, Herefordshire, Derbyshire, Northamptonshire,

Lincolnshire, Suffolk, Sussex, Dorset, Wiltshire, and several of the Welsh counties, escaped with a few cases at perhaps one village or town. Some towns, such as Birmingham, Cheltenham, Cambridge and Hereford, had only a few cases (or none) in 1832 as in the later epidemics in England. Most of the towns which now head the list of high death-rates by common summer diarrhoea, chiefly infantile (as in the preceding chapter), had only a few imported cases but no real epidemic extension; these were Preston, Blackburn, Bury, Rochdale, Oldham, Bolton, Halifax, Leicester and Coventry; while Bradford, Stockport and Wigan had comparatively few. The greater epidemics, besides those which started the disease at Sunderland and Newcastle, were, in order of time, at Hull and Goole, Liverpool, Manchester, Warrington, Leeds, Sheffield, Nottingham, Bristol, Plymouth, with Devonport and Stonehouse, Southampton, Portsmouth, Exeter, Salisbury, various towns of the Black Country in South Staffordshire, Dudley, Merthyr Tydvil, Carlisle, Whitehaven, with other ports of the Cumberland coal-fields, and Douglas in the Isle of Man. Devonshire, Cornwall, the West Riding of Yorkshire, Worcestershire and Warwickshire had each a large number of minor centres, besides the greater foci at Plymouth and Exeter, and at Leeds and Sheffield. The severity of the disease in some parts of England called forth a few special accounts, from which certain representative details may be taken.

The most disastrous outbreak in all England was at Bilston, in the centre of the Black Country, near Wolverhampton[1]. The first cases in that part of England were at Dudley early in June, in some travelling German broom-sellers. In the end of June a canal boatman from Manchester died of cholera in his boat four miles from Wolverhampton; the boat was sunk. In the first week of July another canal boatman died of cholera at Tipton, after returning from Liverpool. The infection became established during July in the parish of Tipton, thickly peopled with miners and iron-workers[2]. At length on the 4th of August a case occurred in the adjoining town of Bilston, about two and a half miles to the south-east of Wolverhampton.

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[1] The populous parishes of the Black Country around Wolverhampton came under notice in another way in 1832 as a crucial instance in the redistribution of seats by the Reform Act.

[2] T. Ogier Ward, "Cholera in Wolverhampton in Aug.–Oct. 1832," *Trans. Prov. Med. and Surg.* Assoc. II. 368.

Bilston was a town of 14,492 inhabitants, nearly all of the working class. It was irregularly built on high ground, full of forges and surrounded by mines. Its soil was perfectly dry "from the water having been drawn off for the purpose of getting the mines[1]." The streets were for the most part wide and open; many houses stood in courts and back yards, but the town was so irregularly built as not to be densely crowded. The Birmingham and Staffordshire Canal passed through the whole length of the township, and there was one small brook traversing the town. The people usually earned good wages, but trade had been depressed since March, 1832. There was a good deal of drunkenness among them, and a peculiar addiction to the sports for which the Black Country is still celebrated, including at that time bull-baiting. The public health was in general good, the deaths having been 23 in May, 31 in June, and 25 in July. The churchyard of the original chapel was full; a new chapel had been built, and a burial-ground consecrated, in 1831. Bilston wake had been held on 29th July, 1832, with the usual orgies notwithstanding the depression of trade. On the night of Friday the 3rd of August a married woman in Temple Street, occupying a poor and filthy house, who had supped heartily on pig's fry and had drunk freely of small beer, was seized with purging, which turned to fatal spasmodic cholera. Within an hour medical aid was sought for two more cases of the same in poor and filthy houses in Bridge Street and Hall Street, about four hundred yards from each other and from the house in Temple Street. At the back of the latter was a most offensive pigsty, and beyond the pigsty a poor cottage in which lived a widow and four children; cholera attacked them, two of the children dying on the 6th August and another on the 7th. The night of the 9th of August was most oppressively hot. In the week ending the 10th August there had been 150 cases and 36 deaths from cholera. On the 10th the disease appeared in a new quarter to the west, called Wynn's Fold; the 12th was again an oppressively hot day, followed by rain over-night. On the 14th the disease began its ravages in Etlingshall Lane, at the western end of the township, a mile from the scene of the first outbreak. The attacks in the week ending 17 August had risen to 616 and the deaths to 133. On the 16th it was remarked that the flies had disappeared and the swallows with them; both came back together when the epidemic was declining. Whole families were now being cut off, father, mother and perhaps three children. Mr Leigh, the curate of the parish, went on the 18th to Birmingham to secure a supply of coffins and medical aid, the medical men of the town being worn out (two of them died a few days after). The deaths between the 19th and 26th of August numbered 309. On the latter date a dispensary was opened, after which the proportion of fatalities to attacks became less. On the 18th of September, the last death occurred, and the epidemic was over, having attacked 3568 in a population of 14,492, and destroyed 742, of whom 594 were over ten years of age. The following is the complete bill:

Cholera at Bilston, 1832.

Week ending		Attacks	Deaths	Deaths under ten years
Aug.	10	150	36	5
	17	616	133	23
	24	924	298	58
	31	832	184	34
Sept.	7	694	62	18
	14	250	23	6
	21	102	6	4
		3568	742	148

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[1] Rev. W. Leigh, *An authentic narrative of the awful visitation of Bilston by Cholera in Aug.–Sept.* 1832. Wolverhampton, 1833.

No fewer than 450 Bilston children under the age of twelve were left orphans by the cholera; for them a national subscription was made to the amount of £8536. 8*s.* 7*d.*, and applied to the building and support of a Cholera Orphan School, which was opened on the 3rd of August, 1833, the first anniversary of the outbreak of cholera in the town.

In the adjoining parish of Sedgley, although the deaths were only 290 in a larger population (20,577), the infection was as severe in certain places. "Sometimes a whole hamlet seemed to be smitten all at once, so that, in some of the streets, or rather rows of tenements, there was scarcely a house without one sick, or dying, or dead." At Tipton, in one family of 14 no fewer than 12 died; and in eight different tenements every inhabitant was swept off. At Dudley one had a narrow escape of being buried alive. In twelve parishes or townships, with a population of 160,000, cholera attacked about 10,000 and cut off about 2000. The effects of the pestilence were all the more terrible from its swiftness, for in each parish it was in full vigour not above a month. The population of miners and iron-workers, a rough set addicted to brutal sports and to drunkenness, could not believe that brandy was not a specific, and made it circulate at funerals to fortify against infection. A reformation of morals and revival of religion is said to have followed the scourge[1]. The following is the list of chief centres in the Black Country:

	Cholera deaths		Cholera deaths
Bilston	693	Wednesbury	78
Tipton	281	Walsall	77
Sedgley	231	Newcastle-under-Lyme	60
Dudley	277	West Bromwich	59
Wolverhampton	193	Darlaston	57
King's Winford	83	Stoke-on-Trent	46

Wolverhampton, which was one of the chief Staffordshire centres of the next cholera in 1849, got off somewhat easily in 1832 with 576 attacks (193 deaths), or one in forty of the population.

It was most common and fatal in a lane called Caribee Island, a narrow filthy cul-de-sac with an open stagnant ditch down the middle, inhabited chiefly by poor Irish. The influence of ground soaked with sewage was shown also in the frequency of cases of cholera among persons in easy circumstances in the residential locality of Darlington Street—"a wide airy street consisting of two rows of houses at its upper end, nearest the centre of the town, but of only one at the lower part, where it is a raised causeway, open on one side to the gardens and meadows beyond. The lower rooms of the houses, being below the level of the street, are consequently very damp; and within a few yards of the backs of these houses runs a wide ditch, the main sewer of that side of the town, which is dammed up and diverted into several large cesspools, or receptacles for the mud and filth which it deposits. These, in warm weather, emit such offensive exhalations as to be almost intolerable to the persons who live near them....It is singular that this was the only part of the town in which persons in easy circumstances took the disease[2]."

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[1] Rev. C. Girdlestone, *Seven Sermons preached during the prevalence of the Cholera in the parish of Sedgley, with a narrative of that visitation.* London, 1833.

[2] T. Ogier Ward, u.s., p. 376.

The cholera had reached Liverpool in the end of April (perhaps from Hull and York), and attacked 4912 in a population of 230,000, causing 1523 deaths before the end of autumn. The very large number of cellar-dwellings and back-to-back houses in the town at that time favoured the infection; but Liverpool was on all subsequent occasions one of the worst centres. Two incidents in 1832 are connected with ships.

On 18 May, 1832, the 'Brutus,' of 384 tons, sailed from Liverpool for Quebec, with a crew of 19, and 330 emigrants who were pauper families from agricultural districts sent to Canada at the cost of their respective poor-law Unions. The emigrants were ill-provided with bedding and clothes, and the ship was under-provisioned. Two days after sailing, or seven days, or nine days (accounts differing), a case of cholera occurred in an adult, who recovered. Other cases quickly followed, with enormous fatality, until the deaths reached 24 in a day. On the 3rd of June the captain put back for Liverpool, his provisions having run short, and his drugs (laudanum) being exhausted. By the time the ship reached Liverpool there had been 117 cases of cholera (of which four were among the crew) and 81 deaths, seven cases remaining at her arrival, of which two ended fatally, making the deaths 83[1].

Another Liverpool incident is noteworthy:

"One morning a mate and one or two men, who had gone to bed the preceding evening in good health on a vessel lying in one of the Liverpool docks, were found suffering from cholera. The men were immediately removed to a hospital and the vessel ordered into the river; when another vessel, with a healthy crew took its situation in the dock: the next morning all the hands on board the second vessel fell sick of the cholera. Upon examining the dock in this part, a large sewer was found to empty itself immediately under the spot where these vessels had been placed[2]."

One of the ablest accounts of the cholera of 1832 was that by Dr Gaulter, of Manchester. The deaths there were 706, and 216 in Salford; but it appeared surprising that, being so many and widely spread, they should not have been many more.

An inspection by the local Board of Health two months before the first case appeared "disclosed in the quarters of the poor—a name that might be almost taken [at that time] as a synonym with that of the working classes—such scenes of filth and crowding and dilapidation, such habits of intemperance and low sensuality, and in some districts such unmitigated want and wretchedness," that the picture correctly drawn seemed to many a malicious libel. From that picture, "it was certainly to have been expected that nearly the whole mass of the working population would have been swept away by the disease." There were few good sewers, and it would have required £300,000 to sewer Manchester thoroughly. As it was, the infection

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[1] James Collins, M.D., *Lond. Med. Gaz.* 30 June, 1832, p. 412; and report by Thompson, surgeon of the 'Brutus,' in the *Cholera Gazette*, s.d.

[2] Henry Gaulter, M.D., *The Origin and Progress of the Malignant Cholera in Manchester.* London, 1833, p. 113.

progressed slowly from the first case on 17th May until the end of July[1]. It was the same in Salford, where it "crept about slowly for three or four weeks attacking solitary individuals or single families in streets and situations the most distant and unconnected, and then suddenly fixing itself in the lower and most populous part of the town." It was in the end of July and beginning of August that the sharp outburst took place in Manchester also. An old soldier well known in the streets as a seller of matches, who "could take a pint of rum without winking," died of cholera in Allen's Court. His body was allowed to lie in the house two days and a half. In four houses of Allen's Court, 17 cases occurred within forty-eight hours, of which 14 were fatal; this court was afterwards known as Cholera Court. In the same few days the infection was most deadly in Back Hart Street, "infamous as a nest of vagabonds and harlots," and in a street behind it, in which nearly the whole of fourteen attacks ended fatally. Blakely Street, a bad fever locality in the time of Ferriar (*supra*, p. 150), had the most malignant kind of cholera in its lodging-houses. It was remarked that few of the factory hands took it: of 1520 employed in Birley and Kirk's mill, only 4 were attacked during the epidemic; more women than men took cholera, and generally those that were employed about dwelling-houses were the victims[2].

The whole cholera bill at Manchester was as follows:

Progress of the Epidemic.

	Attacks		Attacks		Attacks
May	4	August	650	Nov.	33
June	37	Sept.	261	Dec.	2
July	108	Oct.	172	Jan.	2

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[1] The first case was of a coach-painter, who had had frequent attacks of painter's colic. Opposite his house was a large stable dunghill in a very foetid state. On the evening of the 16th May he had eaten a heavy supper of lambs' fry, and had been ill thereafter, the symptoms becoming those of Asiatic cholera on the night of the 18th, death ensuing at 2 p.m. 20th.

[2] In the hamlet adjoining a cotton-mill at Hinds, near Bury, consisting of thirty cottages in a row between the mill lade and the canal, wretchedly built, without chimneys, with windows that would not open, the inmates sleeping four or five in a bed, there were 32 cases of cholera with 7 deaths, but none of these were in persons who worked in the mill. Gaulter, u.s. citing Goodlad. He cites also Flint, of Stockport, for the rarity of attacks among the mill workers in that town. See also Samuel Gaskell, "Malignant Cholera in Manchester," *Edin. Med. and Surg. Journ.* XL. 52. The microbic theory, or, as it was then called by Sir Henry Holland and others, the "hypothesis of insect life," was happily thought of by a working cotton-spinner in Manchester to explain the immunity of the mill-workers in 1832. Gaulter (u.s. p. 120) gives in correct English what would probably have been said in the vernacular as follows: "I've been thinkin', Maister," said a spinner to Mr Sowden, millowner, "as how th' cholery comes o' hinsecks that smo' as we corn'd see 'em, an' they corn'd live i' factories for th' 'eat and th' ile. Me an' my mates wor speakin' o't last neet, an' we o' on us thowt th' saäm thing." Hahnemann, cited by the *Times*, 17 July, 1831, believed that the cholera insect escaped from the eye, and fastened upon the hair, skin, clothes, &c. of other persons. The common microscopic objects uniformly found in the choleraic discharges by later observers have been vibrios, of which half-a-dozen, or perhaps a dozen, varieties have been distinguished. One of these was somewhat audaciously named the "cholera germ" or "comma bacillus of cholera" by Dr R. Koch, who went to Calcutta in 1884. All vibrios, which have a corkscrew form when in motion, are apt to assume the comma form when at rest.

Ages of the patients.

	Attacks	Deaths		Attacks	Deaths
1—15	199	101	45—55	197	116
15—25	153	53	55—65	120	85
25—35	264	98	65—80	85	68
35—45	192	93			

Three cholera hospitals were provided in Manchester, at which about one-half of all the cases were received:

	Cases	Deaths
Swan Street Hospital	443	234
Knott Mill Hospital	242	122
Chorlton on Medlock Hospital	29	17
At their homes	697	335

In Salford all the patients were treated at their homes—644 with 197 deaths; there were also 60 cases among the prisoners in the New Bailey, with 19 deaths.

The Swan Street Hospital was the occasion of a remarkable cholera riot on the 2nd of September. A mob numbering several thousand persons filled the streets near the hospital; in the thick of it was carried a small coffin, from which the headless trunk of a child was taken at intervals and shown to the crowd. The child had died of cholera in the hospital and the body had been examined *post mortem.* Some rumours of this had gone abroad, the body was exhumed, and was found unaccountably mangled. This was the time when intense feeling had been roused all over the country by the procuring of bodies for anatomical dissection, the prejudice extending to the ordinary pathological inspection also. At Sunderland the holding of two or three necropsies had turned the people against the Cholera Hospital. At Dublin there was a rigid rule that no body was to be examined after death in the great cholera hospital of some 700 beds. The body of the child exhumed at Manchester had been found with the head severed, and the rioters declared that it had been murdered. They broke into the hospital, carried off the patients to their homes, and wrecked the furniture and fittings of the wards. The military was at length called out to clear the streets[1].

The epidemic of cholera at Bristol reproduced most of the incidents at other places. There had been numerous suspicious cases of choleraic disease in the early summer, including an outbreak in the gaol in the first week of July.

The first unequivocal cases occurred on the 11th July in a filthy court, in strangers from Bath where there was then no cholera. About the same time the infection showed itself at several places apart, especially in the destitute suburb of St Philip, in the south-east of the city. One of the worst centres was the city Poorhouse, in which 268 cases with 94 deaths occurred from the 24th July to the 20th August. The largest number of seizures on one day was 79 on the 17th August, the largest number of deaths 33 on the 15th. After that it gradually declined, and was over by the middle of November. The attacks reported were 1612, the deaths 626; but these figures came short of the truth, as many cases were not reported, and the burials from all causes were in excess of the average for the season after deducting the reported cholera deaths. Although it fell at Bristol, as elsewhere, upon the

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[1] *Times*, Sept. 5, 1832.

poorest quarters and the most abandoned or destitute class, yet it showed caprices among these. Marsh Street, the abode of the lower Irish, and one of the most thickly peopled parts of the city, was the last place visited. Lewin's Mead, a low and crowded quarter, had only a few scattered cases[1].

Little is known of the great epidemic in Plymouth, Devonport, and East Stonehouse, beyond the gross result that it caused 1063 deaths in the town and the two dockyards[2]. Of the outbreak at Southampton not even the figures are known, the only important omission, besides the epidemic at Salisbury, in the whole of the cholera of 1832. On the other hand the Exeter cholera has been related at greater length than any[3].

It was mainly an autumnal outbreak, the largest number of attacks on one day being 89 on the 13th August, and the maximum daily burials 30 a few days before. The total attacks were 1135, the deaths 345; they were chiefly in the south-western suburb of the city, among the poorer class, the two St Mary parishes having 3·65 and 3·26 per cent. of their population attacked, the parish of St George 3·41, St John 2·73, and Trinity 1·54, while two whole parishes had no cases.

Somewhat late in the autumn the infection spread through Cornwall. Its general prevalence was also late in the South Wales mining district (insignificant compared with its enormous ravages there in the next cholera of 1849) and in Carlisle, in Whitehaven and the other seaports of Cumberland. Hartlepool, for all its nearness to the original centre of cholera infection in Sunderland, was one of the last places to be infected, in the autumn of 1832[4].

The Central Board of Health made no report upon the cholera of 1832, unless a document sent to the king (William IV.) may have consisted of something more than the alphabetical list of infected places, with dates and numbers, which Sir James

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[1] John Addington Symonds, "Progress and Causes of Cholera in Bristol, 1832." *Trans. Prov. Med. Surg. Assoc.* III. 170.

[2] Some cases were detailed by Edward Blackman, M.D., *Lond. Med. Gaz.* 1832, pp. 473, 546.

[3] Thomas Shapter, M.D., *The History of the Cholera in Exeter in* 1832. London, 1849, pp. 297.

[4] Besides the papers or books already cited, accounts were published for the following places: Warrington, by Mr Glazebrook, secretary to the Local Board of Health; Oxford, by Rev. V. Thomas; Hull, by James Alderson, M.D.; Kendal, by Thomas Proudfoot, M.D. (*Edin. Med. and Surg. J.* XXXIX. 85); various places by J. Y. Simpson, M.D. (*ibid.* XLIX. 358); Tynemouth, by E. H. Greenhow, M.D. (*Trans. Epid. Soc.* 1861); London, by Halma-Grand (*Relation* etc. Paris, 1832), and by Gaselee and Tweedie (Lond. 1832). There are also various minor notices: for Whittlesea (*Lond. Med. Gaz.* I. 1832, p. 448), Hutton, Yorkshire (*ibid.* II. 1832, p. 316), York (*Lancet*, 13 Oct. 1832, p. 72), Cheltenham, showing how it was kept free (*ibid.* Nov. 10, p. 210), St Heliers, Jersey (*Lond. Med. Surg. J.* II. 359), Derby (*ibid.* II. 383).

Clark found some years after in a drawer of the royal library. But some lessons of the epidemic were obvious without the aid of an official report. The late summer and autumn was undoubtedly its chief season—except in places where the poison had, as it were, spent itself in the winter or early spring, such as Sunderland and Musselburgh. A subsidence and seeming extinction of the epidemic in spring and early summer was observed at Glasgow and Edinburgh as well as in London; but it was far otherwise in Paris, where sixteen thousand deaths occurred in the single month of April[1]. As to locality, the infection seemed to prefer low grounds, such as the shore quarters of seaports and the banks of rivers. The town moor of Sunderland, around which the infection found its first habitat in Britain, appeared to be a typical cholera soil—a wet bottom of tenacious clay, almost impassable in winter from the water standing in it, the surface covered with heaps of excremental and other refuse from the crowded lanes near it. But the greatest centre of cholera in England in 1832, the town of Bilston, seemed to be the reverse of this—a rising ground from which the water had been drained away by the numerous mines of coal, iron and limestone all round it. Again, in towns or villages built upon a slope or on heights and hollows, such as Gateshead, Newburn and Collieston (most of all in Quebec on the steep bank of the St Lawrence), the infection did not confine itself to the lower part only. But it was remarked that among the Tyneside villages several on high ground escaped altogether, although within a mile or two of others severely visited. This question of elevation comes up more definitely in the cholera of 1849.

Another obvious thing in the epidemic of 1832 was that many of the first victims were among the destitute, drunken or

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[1] The daily mortality in Paris at the beginning of the epidemic was as follows (*Annual Register*, 1832, p. 318):

Days	Cholera deaths	Days	Cholera deaths	Days	Cholera deaths
March 27–31	98	April 6	416	April 12	768
April 1	79	7	582	13	816
2	168	8	769	14	692
3	212	9	861	15	567
4	242	10	848	16	572
5	351	11	769		

To the 16th of April the deaths were about 8700; before the end of the month the total was nearly doubled. As the whole cholera mortality of Paris in 1832 was about 19,000, April must have had much the greater part of it.

reckless class. But there were innumerable exceptions, notably in Paris, where the multitude of victims included several peers, deputies, diplomatic personages and the prime minister.

One of the most striking things in the habits or preferences of cholera in 1832 was the early and unaccountable selection of the inmates of lunatic asylums, the fatuous paupers of workhouses, prisoners, or other immured persons badly housed and ill-fed. In most of these cases it was a mystery how the poison of cholera had got inside the walls. The earliest important instance was that of the Town Hospital or pauper infirmary of Glasgow. Other instances were the lunatic wards of Haslar Hospital, Hanwell asylum, Bethnal Green lunatic asylum, Lancaster county asylum, the Manchester New Bailey, situated in Salford, Coldbath Fields Prison, London, Clerkenwell workhouse (65 deaths), Bristol poorhouse (94 deaths). In the remote Westmoreland village of Hawkshead, thirteen miles from Kendal, cholera appeared unaccountably among the sixteen inmates of the poorhouse, attacking eight of them with sudden and severe symptoms so that four died; it was impossible to trace the introduction of the virus, but the poorhouse was nearly surrounded with stagnant water[1].

Hardly anything was more keenly debated than the question as to how cholera spread. It was not difficult to find some instances of infection seemingly got from contact with living or dead cholera bodies: cases suggestive of that occurred at Sunderland at the outset, and later in Ireland more especially[2]. In the Swan Street cholera hospital at Manchester, eight nurses took the infection, of whom four died. But on the whole the immunity of nurses (as in the Great Gorman Lane hospital of Dublin) and of medical men was remarkable. Although constantly in the presence of cholera patients, sometimes lingering over them, as in the operation of blood-letting, very few took the disease. In Manchester only one medical practitioner was known to have had an attack, a mild one. Gaulter says that Dr Alsop, of Birmingham, and Mr Keane, of Warrington, were the only two medical men known to him to have died of cholera in England; but two of the Bilston doctors died in the height of the epidemic there, one died at Musselburgh, seven at Sligo, and two at Enniskillen. The truth of the matter in cholera appeared to be the same as in plague and yellow fever, the two great infections that resembled cholera most closely as soil-poisons: namely, that contagion from the persons of the sick was a contingency, as Rush, of Philadelphia, had taught for yellow fever in the end of last century, and Blane

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[1] Proudfoot, *Edin. Med. and Surg. Journ.* XXXIX. 99.

[2] Graves, who was a strong contagionist (l.c. 1848–49), cites the instances of nuns, nurses and porters at Tuam, and of medical men at Sligo.

had taught after him. A London writer stated this very fairly in 1832[1]:

> "I believe that this disease, like many other epidemic diseases, although communicable by miasma in the atmosphere, and originating or being producible from a peculiar state of that acting upon the earth, is sometimes contagious (or communicable from person to person) and sometimes not contagious. I believe the contagious nature of the disease depends: first, upon the number accumulated in one place, and the unhealthiness or ill-ventilated state of that place; or, in other words, upon the degree in which the miasma is condensed; secondly, upon the length of time a person remains exposed to the poison; third, upon the debility, or morbid irritability, and consequent susceptibility of the person's frame, especially of the abdominal viscera." The miasmata of an apartment, to be strong enough to become contagious, must arrive at a certain degree of concentration.

Cholera was, at all events, very different from typhus fever in the point of contagiousness: for in the epidemics of the latter many medical men fell victims, and the susceptibility to contagion was greater in proportion to the health and vigour of those who mixed with the sick.

It was well understood in 1832 that foul linen, bedding and clothes were a most certain means of carrying the poison, especially if they had been kept concealed for a time, or packed away in a chest or bundle. This was precisely the old experience of plague. The theory that the poison of cholera was conveyed in the drinking-water, of which illustrations were collected in 1849 and 1854, was not applied to any of the particular outbreaks in 1832. But one writer made a guess at it, assuming, as Snow did in 1849 and 1854, that the stomach and bowels were the organs by which the virus entered the system:

> "From an attentive observation of the course this epidemic has taken in those places and countries which it has hitherto visited, I have been induced to draw the conclusion that a noxious matter or poison, being generated in the earth, has been diffused in the different springs in such situations [therefore he suggests the filtering of water through charcoal], and that this matter, being conveyed into the stomach with the fluid in question, produces that train of symptoms which, commencing in this organ, afterwards extends with more or less rapidity to the rest of the body[2]."

In the treatment of cholera in 1832 many things were tried. The view taken of the pathology naturally determined the means of cure. To check the premonitory diarrhoea was seen to be of the first importance, and to that end laudanum or other form of opium was the familiar means. Lawrie, at Glasgow, found it most satisfactory, at a time when the profession in London were, as he says, denouncing it as a pernicious error. Towards the end of the epidemic in Dublin, Graves combined with the opium acetate of lead in large doses (a scruple of acetate of lead with a grain of opium,

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[1] G. D. Dermott, lecturer in Anatomy and Surgery, *Lond. Med. and Surg. Journ.* 1832, p. 274.

[2] John Parkin, surgeon H.E.I.C.S., "Cause, Nature and Treatment of Cholera." *Lond. Med. and Surg. Journ.* 1 Sept. 1832.

divided into twelve pills, one to be given every half-hour until the rice-water evacuations from the stomach and bowels began to diminish)[1]. Some professed to find great benefit from blood-letting at a sufficiently early stage in the attack[2]. The enormous drain of the fluids, leaving the blood thick or tarry, suggested to some that saline substances would be beneficial. The saline treatment was indeed the principal subject of writing during the year 1832. One way was to give saline drugs by the mouth; another way was to inject into a vein a large quantity of distilled water with some common salt and bicarbonate of soda dissolved in it, the vein at the bend of the elbow being usually chosen to operate on. Some were confident that they had saved lives in this manner, others were equally clear that salines were useless. One writer had abandoned salines by the mouth as a "most useless remedy," while he had not lost faith in their intravenous injection, four having recovered out of twenty-three in which he had tried it. At length, however, the intravenous use of salines was abandoned also[3].

It is well known that the greatest of all the lessons taught by cholera was the need of sanitary reform. The disease in its successive visitations so obviously sought out the spots of ground most befouled with excremental and other filth as to bring home to everyone the dangers of the casual disposal of town refuse. It was not until some years after the first visit of cholera that much was done in the way of extending the main drainage of towns, connecting the house-drainage systematically therewith, getting rid of open nuisances in back yards, and protecting the water-supplies from contamination. The Report of the Health of Towns Commission, 1844, was "the great magazine from which sanitary reformers drew their weapons[4]." In the next few years an active school of sanitarians arose, including

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[1] Graves, *Clinical Medicine*, 1843, p. 700: "I could bring forward the names of many medical men in Dublin whose lives, I am happy to say, were saved by the use of this remedy."

[2] Paterson, u.s. for the fishing village of Collieston, Aberdeenshire: "In most instances where the lancet was used at the proper period little else was required. The patient, although in an apparently hopeless state at the time of my visit, was in these instances not unfrequently in the course of twenty-four hours out of danger."

[3] A correspondent of the *Lond. Med. Gaz.* Sept. 1832, p. 731, dating from Warrington, proved by a statistical arrangement of 103 cases of cholera, that the saline treatment was nearly certain recovery, that the same combined with blood-letting was certain recovery, that blood-letting alone was certain death, and that opium with stimulants, and Morison's pill, were each uniformly followed by a fatal result.

	Cases	Deaths	Percentage of recoveries
Aged, neglected or seen too late	30	30	0
Obstinately refused medicine	4	4	0
Treated by opium and stimulants	23	23	0
,, by Morison's pill	3	3	0
,, by blood-letting	13	13	0
,, by blood-letting and salines	7	0	100
,, by salines alone	23	2	92·3
	103	75	27 per cent.

[4] *Quarterly Review*, CXVIII. 256.

Sutherland of Liverpool, Grainger of London, and others. In 1848 was passed the first Public Health Act, administered by a Board of Health, of which Lord Shaftesbury was chairman, Chadwick and Southwood Smith members. London was excepted from the scope of the Act; but the City had a most vigorous medical officer in the person of John Simon, whose reports dealt with public sanitation on broad principles applicable to the capital and the whole kingdom. The movement in favour of sanitation, thus begun, received an irresistible impulse from the cholera of 1849, the lessons of which were as obvious as those of 1832.

The cholera which reached Orenburg in 1829 and Astrakhan in 1830 lingered in one part of Europe or another until 1837, Portugal and Spain having been its chief theatre in 1833, the south of France in 1834, Italy in 1835 and 1836, Austria, the Tyrol, Bavaria and (for the second time) Poland and the Baltic ports in 1837. In England, there was some revival of the seeds of it in 1833, as many as 1454 deaths being put down to Asiatic cholera in London from the 1st of August to the 7th of September. There was an undoubted epidemic of it at the fishing village of Ferryden, near Montrose, in June, 1833 (27 deaths during four weeks in a population of 700), the infection having been brought by one or more of the crew of the smack 'Eagle' from the Thames[1]. In Glasgow a case occurred in Boar Head Close, High Street, on 30 May, 1833, which had the blueness, pinched face, whispering voice and cold clammy skin of Asiatic cholera[2]. In Ireland there were a good many outbreaks in 1833, especially in villages or hamlets, and it is believed that these were renewed in 1834. But the most singular reappearance of cholera in the British Isles was in the month of December, 1837, some two months after it is believed to have ceased elsewhere in Europe. Outbreaks of true cholera in that month were observed at several places in the south of Ireland—around Bere Haven[3], at Youghal, at Waterford, and at

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[1] Reported by Brewster to J. Y. Simpson, *Edin. Med. Surg. Journ.* XLIX. (1838), p. 368.

[2] *Glas. Med. Journ.* VI. (1833), p. 366. Stark says, perhaps for Edinburgh, that cholera recurred in the end of 1833 and beginning of 1834, with a high degree of fatality.

[3] Edmond Sharkey, M.B., *Dubl. J. Med. Sc.* XVI. 13. Of 28 houses or cabins (nearly all in three hamlets) which together had 76 cases, 16 cabins had each two cases, 8 had each three, 1 had four, 2 had each five, and 1 had six. The type of sickness was the same as in 1832–33.

Dungarvan, where they went so far as to form a board of health[1]. It was suspected to have been in Limehouse, on the Thames, in November. The most remarkable explosion of it was in the month of January following (1838) among the inmates of the Coventry House of Industry, of whom no fewer than 55 died in the course of four weeks—a mortality from choleraic disease that could hardly be explained on the hypothesis of cholera nostras even if the season had been the proper one[2].

The Cholera of 1848–49 in Scotland.

The invasion of cholera from India, which reached Britain in the autumn of 1848, had progressed as far as Peshawur and Cabul from 1842 to 1844, and thereafter step by step continuously through Herat, Samarkand, Bokhara, Astrabad and Teheran by the caravan routes. In the beginning of 1847 it entered Russia by the two great interior waterways of the Volga and the Don. Next year, 1848, it reached the German shores of the Baltic and North Seas, and within a few weeks of its appearance at Hamburg, it was found established on British soil at Edinburgh and Leith in the beginning of October. The severe outburst which followed in the south of Scotland was purely a winter epidemic, like that of Durham, Northumberland and East Lothian on the last occasion in the winter of 1831–32. It will not be necessary to give the details of the cholera of 1848–49 so fully as has been done for 1831–32, but merely to notice special points.

The cholera of 1848 broke out almost simultaneously at Newhaven and Edinburgh, on the 1st and 2nd of October, and

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[1] R. Green, M.D., *Lancet*, 14 April, 1838, p. 83: true Asiatic cholera began at Youghal in the second week of December, 1837, and lasted two months, about 200 having been attacked: "two of my relatives, Miss A. —— and Mrs K. ——, died in December of cholera, one in fourteen hours, the other in ten hours."

[2] Deaths from Cholera in the Coventry House of Industry:

1838.

Jan. 7—11	Jan. 12—16	Jan. 17—21	Jan. 22—26	Jan. 27—31	Feb. 1—5	Total
7	4	15	20	7	2	55

Twenty-seven were males and twenty-eight females. The ages were as follow:

under one	1—5	5—10	10—20	20—40	40—60	60—80	80—90	Total
1	6	4	4	3	8	20	9	55

—*Second Report of the Registrar-General*, p. 98.

at Leith on the 9th. At Newhaven nearly the whole population was suffering from diarrhoea, in the midst of which epidemic the true cholera raged for four weeks only, to the 28th October, attacking 30, of whom 20 died. In Leith the deaths were 185 (males 75, females 110). The Edinburgh outbreak lasted until the 18th of January, 1849, causing 801 attacks, with 448 deaths (or 478 deaths, of which 196 were males and 282 females). A cholera hospital was opened in Surgeons' Square on the 28th of October, the admissions and fatalities to 14th December being as follows:

	Females	Males	Total
Admitted	152	96	248
Died	90	64	154

Of the whole 248 cases, the Grassmarket sent 42, the Cowgate 37, the Canongate 33, College Wynd 16, High Street 14, and numerous scattered localities of the New and Old towns one or more cases each. Severe outbreaks took place also at Niddry, Restalrig and Loanhead, villages close to Edinburgh[1]. While this limited epidemic was proceeding in and around the capital, the infection appeared in the mining region of Carron at the head of the Firth of Forth, where there were some 400 cases after the 6th of December, and in some other mining villages of the Scotch midlands.

Glasgow was infected on the night of the 11th November, in the suburban district of Springburn on the north-west of the city close to the Forth and Clyde Canal. The choice of this spot to begin upon was intelligible enough in one way, but singular in another. Springburn had come into existence as a poor village of weavers about the year 1820; before the cholera year of 1832 it had grown to a population of 600, and was thought a likely spot for cholera inasmuch as it was one of the most wretched communities in Scotland. It occupied the site of a half-drained bog below the level of the canal, from which the water percolated into its subsoil; its houses were low, always damp, and full of filth. During all the cholera in Glasgow in 1832 there had not been a case in Springburn until the 6th of September, when a girl of the village came home with it and died; during her brief illness she was visited by the greater

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[1] Stark, *Ed. Med. and Surg. Journ.* LXXI. (1849), p. 388; W. Robertson, *Month. Journ. Med. Sc.* IX. (1849). The other outbreaks reported in that part of Scotland (*ibid.*) were slight—at Dalkeith, Haddington, Borrowstowness.

part of the villagers, but no other case occurred until six weeks after, on the 15th of October[1]. At this spot, where the cholera of 1832 may be said to have left off, it began in 1848 with a sudden explosion of numerous attacks scattered all over the locality; a doctor attended twenty-one cases before he found two together in the same house or even in the same lane. There had been forty cases there in November, before any case was discovered in Glasgow; at length it seemed to spread from Springburn all round as if from a centre, while it also lingered there longer than anywhere else in the city and suburbs[2]. On the 5th of December a case was reported on the south bank of the Clyde, and another on the 9th in the west end. Within a few days the disease fell upon all parts of the city with the suddenness of a thunder shower; it reached a height in the Christmas week, one day, the 30th December, having 158 burials from cholera. After the orgies of the New Year there was a fresh outburst, 235 cases having been reported on the 5th of January. The proportion of fatalities was as high as 60 per cent. at the beginning of the epidemic, 50 per cent. about Christmas and the New Year, and thereafter from 30 to 40 per cent. The epidemic was short and sharp, declining irregularly after the first or second week of January, and ceasing, but for a few dropping cases, about the 8th of March.

The deaths in Glasgow, which included many among the wealthier class and made the festival season of 1848–49 to be long remembered, were about 3800, or 1·06 per cent. of the population (355,800), a higher total but a lower ratio than in 1832, when the deaths, distributed over many more weeks of the year and largely due to two revivals in August and October, were 1·4 per cent. of the population. At Paisley there were 68 deaths from 26 December to 24 February, and at Charlestown 115 deaths all in some five weeks from 15 January to 19 February.

It was in the same season of midwinter that the cholera burst suddenly upon many mining villages of Lanarkshire and Ayrshire.

In that unlikely season there was an almost universal prevalence of diarrhoea. At the mining village of Carnbroe, near Coatbridge, there were five sudden attacks on the last night of the old year, one of them fatal. On New Year's day there were forty attacks, thirteen of them fatal in a few

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[1] Easton, *Glas. Med. Journ.* v. 444.

[2] Sutherland, *Report of the Board of Health.*

hours. Terror seized the whole place: one man cut his throat in sheer fright. Diarrhoea attacked 1100 of the 1200 inhabitants, and turned to spasmodic or rice-water cholera in 240 of them, of whom 94 died, the rate of fatality being excessive only in the first few days. By the end of February the epidemic was over.

In the town of Coatbridge, with a population of 4000, the various grades of sickness were classified as follows:

Diarrhoea	Vomiting, purging and cramp	Rice-water purging	Cholera	Deaths by Cholera
2659	480	175	107	61

In the town of Hamilton, population 9000, the infection was most malignant, 440 cases yielding 251 deaths from the 24th of December to the 7th of March. The same ravages of winter cholera occurred at some of the Ayrshire ironworks, such as Glengarnock, among a very rough and drunken class, who were made more than ordinarily reckless and drunken by this unaccountable visitation. It was also severe in Riccarton and other mining villages round Kilmarnock, but less prevalent in that town itself. Dumfries and Maxwelltown, which had been among the last places visited by the cholera of 1832, were infected in the middle of November, 1848, about the same time as Springburn near Glasgow. One of the Dumfries doctors died of rapid cholera on the 10th December, the parochial board fell into disputes with the faculty, and the infection proceeded amidst great confusion in the poorest parts of the town, causing about 250 deaths before Christmas. After that it subsided quickly[1].

The other centres in the south of Scotland were Selkirk (13 deaths), Kelso (Dec. to end of Jan., maximum of 12 attacks in a day) and Jedburgh, which last had escaped in 1832 but had now a very rapid and extensive epidemic in its lower parts among drunk[illegible] people especially. A few cases occurred at Moffat, in December; a ma[illegible] was seized in crossing the hills died in a shepherd's hut eight miles [illegible]offat after twenty-one hours illness[2].

The only recorded epidemic in the north of Scotland in the proper cholera season, the summer of 1849, was at Dundee. But there was a small outbreak in March and April at Campbelton (41 cases, 14 deaths) and Inverness (23 cases, 12 deaths)[3].

The infection began in Dundee on the 29th of May, 1849, in Fish Street, the filthiest part of the town. It prevailed in high and low situations, but usually in the old localities of typhus fever. One group of houses, said to have had a population of 100, had 40 deaths. Dudhope Crescent, consisting of seventeen large five-storied tenement houses occupied by clean and respectable people, had 57 deaths. In about a fourth part of all the fatalities, death was from sudden collapse; this was a feature of the 1849 cholera also in Ireland; but in Dundee, as elsewhere, there was usually premonitory

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[1] Sutherland, *Report*, u.s.; Grieve, *Month. J. Med. Sc.* IX. 777. Barker, *ibid.* 940 (gives good account of the stormy weather).

[2] *Month. Journ. Med. Sc.* IX. 783, 857, 1011, X. 403.

[3] *Ibid.* IX. 1009.

diarrhoea, and a very general prevalence of diarrhoea which never came to true cholera[1].

The Cholera of 1849 in Ireland.

The cholera of 1849 found Ireland in a state of exhaustion and confusion. The fever and dysentery that followed the great potato famines of 1845 and 1846 were still far from extinct; the workhouses, which had not existed in 1832, were full of paupers. The mortality of nearly half a million in the famine years, and the emigration of perhaps three times as many, had reduced greatly the population of the scattered cabins, hamlets and villages; but the towns were more populous than ever from the immense number of destitute persons that had gravitated to them. In these circumstances it was not surprising that the cholera of 1849 should have been more disastrous than that of 1832. The infection appeared first in Belfast in November, 1848, in a man who had come with his family from Edinburgh and had been admitted into the workhouse. Some thirty cases of cholera among the inmates followed his death, and at length the infection was started at large in the town, probably by a man who had been discharged from the workhouse[2]. The cholera of 1849 in the capital of Ulster was more fatal than that of 1832, causing 969 deaths in 2705 attacks. Over Ireland generally its great season appears to have been, as in England, the summer, and in part also the spring. Excepting Belfast, the principal cities and towns had fewer deaths than in 1832; Dublin having only 1664 as compared with 5632, Cork 1329, or nearly the same number as in 1832, Limerick 746, which was about a fourth less, Galway less, Waterford about the same as in 1832 and 1833 together, and Drogheda as severe an epidemic as last time. But

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[1] Sutherland, *Report*, u.s. The year 1847, in which there was no cholera, had been much more fatal in the chief towns of Scotland, than either 1848 or 1849, owing to the great prevalence of typhus (Stark):

Deaths from all causes.

	1846	1847	1848	1849
Edinburgh	4594	6706	5475	4807
Glasgow	10854	18071	12475	12231
Dundee	1531	2520	2146	2312
Paisley	1429	2068	1552	1712
Leith	801	955	1212	1066
Greenock	1087	2214	1289	2344
Aberdeen	1315	1466	2366	

[2] H. MacCormac to Graves, *Dub. Journ. Med. Sc.* N.S. VII. 245.

the smaller towns and the rural districts generally suffered more. The deaths for all Ireland returned to the Board of Health were 19,325, nearly the same total as in 1832; but there were no returns included from Wicklow, Cavan, Fermanagh and Donegal, and it is probable that the returns were otherwise incomplete, the census taken in 1851 giving 30,156 cholera deaths under the year 1849, and 35,989 in the whole decennial period from 1841. The larger total was distributed as follows:

Urban	Rural	In hospitals	In workhouses
10,653	10,656	7964	6716

The number of rural deaths is much larger than in 1832. There were only a few towns with over 2000 inhabitants that escaped—one in Connaught, six in Munster, one out of forty-one in Leinster, while seventeen towns were visited in Ulster. The counties of Dublin, Carlow, Clare and Galway suffered most; of the smaller towns, Tralee and Dingle lost heavily, both among the poor and the rich. The town of Ballinasloe, near the confluence of the Suck with the Shannon, had 756 deaths from 23 April to 19 August, a great part of them in the workhouse. In clinical characters, the cholera of 1849 was noted in Ireland, as in Scotland and England, for the high proportion of sudden fatalities, about one-third, without the warnings of diarrhoea or the usual choleraic symptoms. It was remarked also that many children under the age of seven died of cholera, about one in ten of all ages. There was a second season in 1850, with 1768 deaths (according to the census), but hardly comparable to the return of cholera in 1833 in the country districts more particularly.

The Cholera of 1849 in England.

The brief but very severe epidemic of cholera in the south of Scotland in midwinter was all over and done with for good before the disease really began in England. Hull, which had a few cases on board ship in the end of 1848, about the same time as the infection began to rage in Edinburgh and Leith, was spared its great visitation, the greatest in all England, until the late summer and autumn[1]. The progress of the infection in

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[1] Most of the information on the cholera of 1849 in England comes from two sources: (1) the *Report of the General Board of Health on the Epidemic Cholera of* 1848 *and* 1849 (Parl. papers, 1850), containing the detailed reports of Mr R. D. Grainger for London, and of Dr John Sutherland for various other towns; and (2) the *Quarterly Reports of the Registrar-General for the year* 1849. See also note 3, p. 846.

London also was strangely different from that in Scotland. There were undoubted cases in Bethnal Green and other out-parishes in the autumn of 1848, and there seemed no reason why the infection should not run through the population and exhaust itself at once, as in Glasgow. But it will appear from the following table of the deaths in London that the real outburst was delayed until the summer and autumn of 1849:

	Cholera deaths		Cholera deaths
1848		1849	
Sept.	11	April	9
Oct.	122	May	13
Nov.	215	June	246
Dec.	131	July	1952
1849		Aug.	4251
Jan.	262	Sept.	6644
Feb.	181	Oct.	464
March	73	Nov.	27

Although a certain number of deaths were returned in October and November, 1848, they came in twos or threes from many parishes of the metropolis and made no great impression upon any one locality. It was not until the beginning of December that the presence of cholera was fully realized, owing to an extraordinary explosion of the disease in a huge pauper institution at Tooting. The school contained about a thousand children, of whom [illegible] three hundred took Asiatic cholera, with one hundred and eighty deaths, in the course of three or four weeks: this was the whole cholera mortality that the parish of Streatham had from first to last. In the spring months the cases declined all over London in a very remarkable way, so that it looked for a time as if the infection were extinct, just as in 1832. But in June there was a revival, and thereafter a steady increase to the maximum of 6644 deaths in September. The table given under the year 1866 shows upon what parishes the mortality fell most—those of Southwark, Bermondsey, Rotherhithe, Greenwich, Newington, Lambeth and Battersea on the south side, of Westminster, the City and Liberties, Shoreditch, Bethnal Green and Whitechapel on the north side of the Thames. It was a more severe visitation per head of the inhabitants than that of 1832, cutting off many beyond the limits of the destitute and reckless class who were its most usual victims on the first occasion. Many of the respectable class of workmen and small shopkeepers were among the victims. Several medical men died of it,

including one well-known surgeon, Mr Aston Key, at his house in St Helen's Place, Bishopsgate, on 23 August, after a few hours' illness. As in Ireland, and at Dundee, an unusually large proportion of the London deaths, perhaps a fourth part, were from sudden collapse and blueness, without premonitory diarrhoea or predominant intestinal symptoms. Opinion was strongly against contagiousness in this epidemic. There were 478 cases treated in St Bartholomew's Hospital, but not one of the nurses took cholera.

The infection seemed to find out the insanitary spots and to act miasmatically upon the residents. The common remark in all parts of England, Scotland and Ireland was that the localities that suffered most from the typhus fever of 1847-48 suffered most also from cholera. The one black spot in Kensington was a poor district on the north side of the parish known as the Potteries, where an immense number of pigs were kept.

One of the most remarkable features of the cholera-seasons of 1848–49 was the extensive prevalence of common bowel-complaints. Evidence of this has been given for the south of Scotland just before or during the cholera of midwinter, a season when diarrhoea is not usual. It was equally remarked in England in the course of 1849. In the Taunton workhouse, where true Asiatic cholera broke out in November, there had been many cases of bowel-complaint, as well as of fever, in the spring (7 deaths from dysentery and diarrhoea, 5 from fever). In the Exeter workhouse there were eighteen deaths from dysentery in the end of the year, although there is nothing said of cholera, which caused only 44 deaths in the whole city. The efforts of the inspectors sent by the Board of Health were in great part directed to finding out the cases of "premonitory" diarrhoea, by house-to-house visitation, and insisting upon the importance of checking it before it could turn to true cholera. Leeds will serve as an example of English towns. In an incomplete survey after the month of July there were found 5129 cases of simple diarrhoea, 1484 cases of dysentery, 1273 cases of choleraic diarrhoea, and 1090 cases of true cholera[1]. It was something of a paradox that, with such excessive prevalence of

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[1] Sutherland, *Report*, u.s. p. 121. At Sheffield (*ibid.* p. 108) a sudden outbreak of diarrhoea occurred on 26 August over the whole town; 5319 cases of it were known, with only 76 cases of cholera and 46 deaths.

ordinary bowel-complaints, an unusual proportion of the cases of true cholera proved quickly fatal with symptoms of collapse and asphyxia only.

Just as the first startling indication of the presence of Asiatic cholera in London was the enormous fatality in the pauper school at Tooting in the winter, so in some other towns the infection seemed to pick out workhouses or prisons to begin upon. At Belfast there were forty cases in the workhouse before there was one in the town. At Liverpool there were 28 cholera deaths in the first quarter of 1849, of which 8 were in the workhouse. At Wakefield, 19 died of cholera in January, 16 of these in the House of Correction. Among the people at large the infection made little progress until the summer. In the first and second quarters of the year it is heard of, but to a moderate extent, in the towns and colliery districts of Durham and Northumberland, which were the scene of its earliest outbreak in the winter of 1831–32. It was also beginning in the poorest and filthiest parts of Liverpool, Bristol and Plymouth. Its great season all over England was July, August and September, the incidence of the disease according to counties being shown in the table. The right-hand column, showing the number of deaths at the principal centres in each county, must serve for a conspectus of the epidemic.

Cholera Mortality in England and Wales in 1849.

	Deaths	Death-rate per 1000 inhab.	Principal centres in each county
England and Wales	53293	3·0	
London	14137	6·2	Lambeth 1618, Newington 907, Bermondsey 734, Southwark 1704
Surrey, part of	255	1·3	
Kent, part of	1208	2·5	Gravesend, Milton, Rochester, Chatham, Margate, Ramsgate, Maidstone
Sussex	346	1·1	Hastings
Hampshire	1245	3·2	Portsmouth 568, Southampton 240
Berkshire	148	·8	
Middlesex	406	2·7	Edmonton, Barnet
Hertfordshire	323	1·9	Hitchin 127, Hertford 81, Watford 45
Buckinghamshire	175	1·2	Marlow, Wycombe 100
Oxfordshire	117	·7	Oxford 44, Witney 33
Northamptonshire	141	·7	Northampton 49, Peterborough 49
Huntingdonshire	14	·2	
Bedfordshire	72	·6	Bedford 37, Biggleswade 28
Cambridgeshire	269	1·4	Wisbech 138, North Witchford 85
Essex	580	1·7	West Ham 134, Romford 163, Rochford 105, Harwich
Suffolk	79	·2	Ipswich 18, Mutford 27
Norfolk	223	·5	Yarmouth 87, Norwich 38

	Deaths	Death-rate per 1000 inhab.	Principal centres in each county
Wiltshire	320	1·3	Salisbury 165, Devizes 67
Dorset	122	·7	Weymouth 59, Poole 31
Devon	2366	4·2	Plymouth 830, Stonehouse 171, Stoke Damerel 721, Plympton St Mary 151, Tavistock 140, Totnes 107
Cornwall	835	2·4	St Germans 236, Liskeard 132, St Austell 135, Redruth 133
Somerset	923	2	Bridgewater 235, Keynsham 77, Bath 90, Bedminster 281
Gloucestershire	1465	3·5	Bristol 591, Tewkesbury 59, Gloucester 119, Clifton 563, Dursley 58
Herefordshire	1	·01	
Shropshire	316	1·3	Bridgnorth 75, Shrewsbury 116
Staffordshire	2672	4·4	Newcastle-under-Lyme 241, Wolverhampton (incl. Bilston, Tipton, Sedgley) 1365, Stoke 103, W. Bromwich 250, Dudley 412, Walsall 186
Worcestershire	432	1·7	Stourbridge 314
Warwickshire	293	·6	Coventry 202, Birmingham 29, Warwick 20
Leicestershire	8	·08	Loughborough 7, Leicester 2
Rutlandshire	7	·4	
Lincolnshire	372	·9	Gainsborough 246, Boston 35, Grimsby 29
Nottinghamshire	137	·5	East Retford 21, Basford 42, Nottingham 18
Derbyshire	50	·06	Derby 18
Cheshire	653	1·6	Nantwich 181, Runcorn 82, Stockport 72, Birkenhead 139
Lancashire	8184	4·1	Liverpool and W. Derby 5308, Wigan 503, Manchester 878, Chorlton 280, Salford 237
West Riding	4151	3·2	Huddersfield 52, Bradford 426, Hunslet 884, Dewsbury 224, Wakefield 241, Pontefract &c. 238, Leeds 1439
East Riding	2140	9	Hull and Sculcoates 1834, York 174, Pocklington 37, Howden 58
North Riding	47	2	Whitby 10
Durham	1[illegible]		Darlington 4, Stockton 248, Durham 192, Hartlepool, Chester-le-Street 134, Sunderland 363, Gateshead 257, S. Shields 201
Northumberland	1417	4·8	Newcastle 295, Tynemouth 815, Alnwick 142
Cumberland	419	2·2	Carlisle 51, Cockermouth 282, Whitehaven 79
Westmoreland	1	·02	
Monmouth	775	4·1	Newport 246, Pontypool 69, Abergavenny 438
S. Wales	3544	6·1	Merthyr Tydvil 1682, Cardiff 396, Neath 738, Llanelly 45, Swansea 262, Carmarthen 142, Crickhowell 95
N. Wales	245	·6	Holywell 86, Montgomery 37, Carnarvon 21

The highest rates in the table are for the East Riding, owing to Hull (24·1), for South Wales, owing to Merthyr Tydvil (23·4), for Northumberland and Durham, for Staffordshire, owing to the iron district round Wolverhampton, for Devonshire, owing to Plymouth, for Lancashire, owing to Liverpool, and for Monmouth, owing to a few mining places. The miners suffered most, the lower class in the seaports next most severely. The Black Country in the south of Staffordshire, which had been the worst centre of the 1832 cholera, was again one of its chief

centres in 1849, the mortality falling most, as before, upon the town of Bilston, and next to it upon Willenhall and Wolverhampton. But a great rival to the Staffordshire coal and iron mining had sprung up since 1832 in Glamorgan; and it was in this comparatively new region of miners that cholera in 1849 reproduced the Black Country horrors of 1832 and, indeed, surpassed them.

Merthyr Tydvil had sprung up more like a vast miners' camp than like a well-ordered municipality. Along the eastern side of the Taff valley, on the slopes and in bottoms of the hills, but everywhere at an elevation of some four or five hundred feet above the level of Cardiff docks, were numerous groups of mean-looking miners' cottages, with their attendant ale-houses, small retail shops, schools and meeting-houses. This peculiar township had drawn to itself the special notice of the Health of Towns Commission in 1844: "From the poorer inhabitants (who constitute the mass of the population) throwing all slops and refuse into the nearest open gutter before their houses, from the impeded course of such channels, and the scarcity of privies, some parts of the town are complete networks of filth emitting noxious exhalations... During the rapid increase of the town no attention seems to have been paid to its drainage."

In this district the registrar had returned 162 deaths from "cholera" in the year 1841, which must have been from an unusually severe type of cholera nostras or British cholera. A first case of Asiatic cholera occurred at Cardiff in a sailor on the 13th of May, 1849, a week after there was a case at Lower Merthyr, and a week after that another at Upper Merthyr. In the course of the summer the ravages of the disease were enormous in the hilly mining regions of the interior of Glamorgan and Monmouth, as well as severe in the seaports:

Merthyr Tydvil	82	Abergavenny district	438
Cardiff	396	Pontypool	69
Neath	[illegible]	Newport	246
Swansea	52		

The peculiar selection of the mining townships was well shown in the district of Abergavenny: of 378 deaths from cholera in the third quarter of 1849, only 9 occurred in Abergavenny town, while 157 were at the iron-works of Tredegar and 210 at those of Aberystruth, just as, in the winter preceding, the villages of the iron-works all round Kilmarnock had been ravaged by cholera while there was little of it in that town itself.

Another chief centre of cholera in 1849 was the port of Hull. Including the district of Sculcoates, it had the following enormous mortalities from cholera in four weeks of September: 398, 507, 524 and 171, the whole epidemic from July to the 18th of October producing 2534 deaths[1]. Its neglect of scavenging became a classical instance of the favouring conditions of cholera. An open space at Witham called the "muckgarths," from the refuse deposited upon it, was one of the worst centres,

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[1] Henry Cooper, "On the Cholera Mortality in Hull during the epidemic of 1849," *Journ. Statist. Soc.* XVI. 347. The total is higher than that in the Table.

just as the town moor of Sunderland, used for the same purpose, had been in 1831[1]. In the other ports, Liverpool, with West Derby, Bristol with Clifton, and Plymouth with East Stonehouse and Devonport, the infection was most severe (see Table), and was observed to choose the poorest streets, lanes and houses, where there had been most typhus for a year or two before[2]. On the Tyne, the greatest centre on this occasion was not Newcastle, but Tynemouth. The city of Durham, which escaped the cholera of 1832, had a severe visitation. The chief inland centres, besides the mining districts of Staffordshire and Glamorgan, were Manchester and the cloth-making towns of Airedale,—Leeds, Hunslet, Bradford, Dewsbury, and some others in the West Riding. Most of the Lancashire towns occupied with the cotton industry again escaped with little cholera—Preston, Clitheroe, Oldham, Bury, Rochdale, Bolton, Blackburn, Ashton and Chorley. Wigan had nearly twenty times as many deaths as in 1832; on the other hand Sheffield had only a quarter of its former cholera mortality, while Nottingham and Norwich had this time very little. Birmingham, Leicester, Cheltenham, Hereford, Stafford, Ipswich, Cambridge and Colchester were again almost or altogether free from infection. The agricultural counties, notably the Eastern counties, escaped once more with few centres of infection, and these unimportant. Cumberland as a whole had fewer deaths than in 1832, while Cockermouth had more. Exeter, which was severely visited on the former occasion, escaped almost wholly, while Totnes and Tavistock, with the surrounding Dartmoor country and other towns in Devon, had epidemics of the first degree for their size. In England as a whole the cholera of 1849 was more severe relatively to the numbers living than that of 1832, its great centres having been the same, or of the same kind, on both occasions[3].

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[1] Sutherland, *Report*, u.s., with map.

[2] For Bristol, Sutherland (p. 126) cites Goldney: "In a certain lodging-house there were 35 attacks and 33 deaths during the epidemic of 1832....Out of the same house in 1849, 64 people were turned, of whom 49 were sent to the House of Refuge." Not one case of cholera occurred among these, but many attacks of diarrhoea, which was general all through the epidemic, especially along the Frome.

[3] The epidemic in the small Devonshire fishing village of Noss Mayo near Plympton St Mary, was very fully investigated by A. C. Maclaren, *Journ. Statist. Soc.* XIII. (1850), p. 103. The Oxford epidemic (75 deaths) was described by Greenhill and Allen in the *Ashmolean Society Reports*. For Tynemouth, see Greenhow, *Trans. Epid. Soc.* The volume by Baly and Gull, *Reports on Epidemic Cholera drawn up at the desire of the Cholera Committee Roy. Col. Phys.* London, 1854, is in great part a review of the epidemic of 1849, in the form of a general discussion of the

The cholera of 1849 reproduced very closely the former characteristics. The attacks were often in the night, especially in persons who had supped heartily on the coarser kinds of savoury meat. With the same undoubted preference for the poorer and more filthy quarters of towns, the infection showed also a certain apparent caprice in fixing on some places and avoiding others.

Thus at Leeds it was most malignant in the locality of York Street and Marsh Lane (an old centre of plague and typhus), which had lately been drained at a cost of some thousands of pounds, "whilst in the adjoining district, which lies nearly level with the river, and will scarcely admit of any sewerage, I have not heard," writes the registrar, "of a single case of cholera"—an experience similar to that of a low-lying district of Bristol in 1832. At Liverpool, where much had been undertaken for sanitation since the disastrous Irish fever of 1847-48, the cholera appeared to Dr Duncan, the medical officer of health, to attack sewered and unsewered streets impartially. Another singular thing, which used to be noticed in the plague and is observed in the malarial fevers of towns abroad, was the choice of one side of a street only: thus, at Rotherhithe, in a street where numerous deaths occurred, they were nearly all one side of the street, in houses occupied by respectable private families, only one house having been infected on the other side; at Bedford, two streets showed the same thing.

In London, the least elevated parishes on both sides of the Thames were again its chief seats. Dr Farr, the superintendent of statistics, deduced the law that the death-rate from cholera in London was inversely as the altitude of the parish, and he showed, by a somewhat rough grouping of the cholera deaths, that the law applied to all England[1]. An empirical generality such as that may have some value; but it is the exceptions to it that show the inward meaning of the fact.

Merthyr Tydvil, which was [illegible] worst cholera-spot in England with the possible exception of Hull, [illegible] hundred feet above the level of Cardiff, its seaport, where the death-rate was much lower. Neath, also, had much more cholera than Swansea. Newcastle-under-Lyme, situated near the source of the Trent, and the highest town in the course of that river, had a far more severe visitation of cholera than any other town upon it all the way to its mouth. At Tavistock among the Dartmoor hills, cholera "sat for many a week," as Kingsley says, "amid the dull brown haze, and sunburnt bents and dried-up watercourses, of white dusty granite." But the poorer and more populous part of Tavistock was a somewhat peculiarly shut-in basin, which was "very often involved in fog during the night." The town had escaped cholera in 1832, but one of its physicians, writing in 1841, and recalling its dreadful plague of 1626, did not feel sure that it would escape if cholera came back[2]. Again, one thinks of Salisbury as standing among high

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whole problem of Asiatic cholera. A subcommittee of the College also published a *Report on the nature of the microscopic bodies found in the intestinal discharges of Cholera*, London, 1849.

[1] Farr, "Influence of elevation on the mortality of Cholera." *Journ. Statist. Soc.* XV. (1852), p. 155, and in the Reports of the Registrar-General.

[2] C. Barham, M.B., "Tavistock Parish Register," *Journ. Statist. Soc.* IV. 37.

downs; but it had a wet subsoil, bad sewerage, and bad water supply, and in 1849 it had 200 deaths from cholera among all classes in two months[1].

In the not very extensive outbreak at Sheffield, one of its chosen seats was an elevated district called the Park, inhabited by colliers. At Bedlington colliery, near Morpeth, the cholera deaths in November were in the miners' houses on the hill side. The elevated, airy and clean village of Loanhead, near Edinburgh, had 46 deaths in its population of 1200, during a few weeks of midwinter. In Dundee, built upon a steep slope at the waterside, there were bad centres of cholera in the higher parts as well as in the lower.

The determining thing appears to have been not so much the elevation as the configuration of the ground; any basin, or cup, or shelving terrace, any natural collecting-ground of moisture and organic refuse in the soil, may become a seat of cholera, whether it be at the sea-level or several hundred feet above it, provided it have a sufficient number of human occupants and a mode of drainage inadequate to its peculiar needs. Such was the situation of Merthyr Tydvil, of Neath, of Newcastle-under-Lyme, of Tavistock, of some colliery villages, and of certain localities in towns such as Dundee. Such, of course, was also the situation of the London parishes next the river on the south and east, of Hull, of Plymouth, of Liverpool, and of other seaports on estuaries. Neither altitude nor configuration means anything for cholera unless the ground itself be full of rotting filth. In all England and Scotland the cholera chose, as if by an unerring instinct, those not very extensive mining parts of the counties of Stafford, Glamorgan, Durham, Lanark and Ayr, which had as many hundreds of inhabitants to the square mile, and as little provision for the safe disposal of their excrements, as those village communities of Lower Bengal in which the infection had become established since 1817 as if it were an annual product of the soil.

The Report of the Board of Health brought to light many instances in which it seemed probable that cholera had been favoured, if not induced, by the water of wells contaminated with organic filth soaking through the ground or entering with the surface water. This was especially the case at Merthyr Tydvil. It was during the next cholera, that of 1854, that the question of contaminated water came into great prominence, in connexion both with wells and with the vast volumes of water supplied through the mains of water companies.

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[1] Middleton, "Sanitary Statistics of Salisbury," *ibid.* XXVII. (1864), p. 541.

The Cholera of 1853 at Newcastle and Gateshead.

The third visitation of Great Britain and Ireland by Asiatic Cholera was in 1853–54. There had been none of it in any part of the kingdom since 1850; but it is not so clear that all other European countries, especially Poland, were equally free from it. Whether due to a new approach from Asia, or to a rekindling of smouldering fires, cholera appeared in the Baltic ports in the summer of 1853, and soon after reached the Tyne. For the third time a severe but localized epidemic was the prelude—this time at Newcastle and Gateshead, just as in 1848 at Edinburgh, Glasgow and the south of Scotland, and in 1831 at Sunderland and Newcastle.

In the cholera of 1849, which was the most general and the most severe visitation that England has had, Newcastle escaped with a light visitation and Gateshead with a moderate or average one, while Tynemouth (with North Shields) had about twice as many deaths as Newcastle and Gateshead together (12·9 deaths per 1000 inhabitants). In 1853 it was the turn of Newcastle—for no better reason, perhaps, than its escape last time. The very thorough and masterly inquiry by Messrs Simon, Bateman and Hume did, indeed, reveal a most unwholesome state of things; but the town was no worse or only a little worse than in 1849, when the cholera had dealt lightly with it, and it was probably an average sample of the insanitary condition of the greater English industrial towns in the time of their rapid growth and before the period of considered local government had arrived. In some parts, such as Sandgate, the dwellings of the labouring class were "not fit to live in"; in the newer mean suburbs, it was found, as in Glasgow twenty years before, that cellars had become the dwelling-places of a class who in former times lived above ground. Those who had been dispossessed by the railways and other public structures had not been provided for elsewhere; so that, with more trade and better wages, the working class were worse housed than before. Overcrowding, for which the ports on the Tyne and Wear are still pre-eminent, was then most excessive. Only the better-class houses had the water laid on. Excremental offences to sight and smell were everywhere. There was a system of main sewers, passably good; but house-drainage or connexions with the main drains

were quite casual. The scavenging of the town was greatly neglected. Piggeries, slaughter-houses and other such nuisances, were uncontrolled. The burial-grounds were over-full. With all this the death-rate of Newcastle could be low enough in a good year, such as 1844, when it was 20·9 per 1000; in the year of the Irish fever, 1847, it rose to 32·8; and in other years it fluctuated between those extremes, according to the nature of the seasons[1].

The cholera of 1853 was a sudden explosion in the heavy stagnant atmosphere of the month of September. No one knew where the infection came from; there were, of course, ships arriving from the Baltic, but no particular source was ever traced. On the 30th or 31st of August, a case occurred of the rapidly fatal kind before a week there were about a hundred attacks daily all over the town. From the 13th of September the deaths in Newcastle mounted up rapidly as follows:

	Cholera deaths		Cholera deaths
Sept. 13	59	Sept. 19	111
14	90	20	85
15	106	21	68
16	114	22	82
17	103	23	60
18	103	24	56

In the thirty days of September there were 1371 deaths, and some one or two hundreds more in the first part of October, when the infection ceased almost abruptly, the total of deaths to the 4th of November having been 1533. During the same time Gateshead with a population of 26,000, had 433 deaths, or in a ratio nearly equal to that of Newcastle. On the other hand Tynemouth, with a population of 30,000, had only twelve deaths, several of them in vagrants or other arrivals from Newcastle, the rest in a cluster of pitmen's cottages on the outskirts of North Shields.

It was freely rumoured at the time, and was even repeated with much unction in so dry and deliberate a work as the report of the Registrar-General, that the cholera at Newcastle and Gateshead in September, 1853, was owing to the sudden contamination of the town's water with sewage. The facts about the water-supply are as follows: Previous to 1848, Newcastle was supplied with Tyne water pumped up at Elswick, and passed through the settling tanks and filtering beds. In 1848 the Whittle Dean Water

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[1] *Report of the Commissioners appointed to inquire into the late outbreak of Cholera in Newcastle, Gateshead and Tynemouth.* Parl. papers, 1854, pp. xl and 580.

Company, incorporated in 1845, had their new supply ready, and the old company, with its pumping station at Elswick, was superseded. The new supply was collected from landward sources, and was apt to be peaty. There was a great demand upon it, especially for public works (it was supplied to comparatively few houses), so that the distribution in 1853 had increased 2½ times since the company began in 1848. They had extended their collecting area to meet this demand; but, owing probably to the drought, they found it necessary on the 6th of July, 1853, to resort to the old pumping-station at Elswick for about a third part of all the water that flowed daily through the mains. This had gone on for eight weeks before the epidemic began, and was promptly discontinued on 15 September, as soon as the possible danger from Tyne water was realized. The pumping-station was higher up the river than the only one of the Newcastle sewers that discharged in its vicinity. There were complaints about the water, but these appear to have been chiefly of the peaty colour or flavour, which came from the Whittle Dean part of the mixture. The water from the mains was not equally bad at all points, as if the suspected contamination might have occurred in its transit through the town. Also the water of some wells was complained of as offensive at the same time, which was the season of the year when the springs are lowest. Gateshead was also supplied by the mains of the Whittle Dean Company. It is clear from the report of the Commissioners that they considered the water of Newcastle and Gateshead to have been a very subordinate factor, if a factor at all, in the epidemic of cholera.

The Cholera of 1854 in England.

The great epidemic at Newcastle and Gateshead was over by November, 1853, those towns having no share in the general epidemic in England in 1854, although it visited their near neighbour Tynemouth. The interest of the cholera of 1854 centres chiefly in London[1]. Few of the great foci of infection in 1849 were visited severely. Liverpool, which never escaped, had a moderate epidemic, Merthyr Tydvil also had about a fourth part of its 1849 mortality, Dudley had the disease somewhat severely, while some towns, such as Norwich, Wisbech and Sheffield, had more than usual. But Plymouth, Hull, Bristol, Manchester, Leeds, the towns of the Black Country and nearly all the populous places that had suffered heavily either in 1832 or in 1849, or on both occasions, escaped in 1854 with little cholera or none[2]. The table shows the incidence of the epidemic (as well as that of 1866) according to counties.

[1] The most elaborate and minute account of an epidemic on this occasion was that for Oxford, *Memoir on the Cholera at Oxford in the year* 1854. By H. W. Acland, M.D., in which all the points in the problem of cholera are illustrated from the easily surveyed local circumstances.

[2] The registration district of Bideford had 46 deaths in 1854, the only large total in the West country. Kingsley's graphic picture of the cholera of 1854 in *Two Years Ago* may have corresponded to these naked figures in the registration tables; but no place in Cornwall, in which county the scene appears to be laid, could have furnished so considerable an epidemic as the novelist describes, a few places in it having had each some half-dozen deaths.

Cholera Mortality in England and Wales in 1854 *and* 1866.

	1854		1866		Principal centres in each county	
	Deaths	Rate per 1000	Deaths	Rate per 1000	1854	1866
England and Wales	20097		14378			
London	10738	4·3	5596	1·9	South of Thames, Eastern parishes	Eastern parishes 3691
Surrey, part of	252	1·2	82			
Kent, part of	1056	2·1	284			
Sussex	94	·3	79			
Hampshire	130	·3	417	·9	Portsea Island 20, Southampton 48	Portsea Island 129, Southampton 41
Berkshire	49	·2	3			
Middlesex, part of	380	2·4	51		Brentford 196	
Hertfordshire	97	·5	9			
Buckinghamshire	68	·5	10			
Oxfordshire	183	1·0	4			
Northamptonshire	152	·7	7		Towcester 86	
Huntingdonshire	18	·3	1			
Bedfordshire	61	·4	22			
Cambridgeshire	270	1·3	7		Wisbech 176, Ely 46	
Essex	513	1·4	471	1·0	West Ham 124, Romford 113, Maldon 102	West Ham 389
Suffolk	67	·2	15			
Norfolk	381	·8	15		Norwich 193, Yarmouth 41	
Wiltshire	60	·2	11			
Dorset	45	·2	6			
Devon	188	·3	525	·9	Plymouth 59, Stonehouse 15, Devonport 2, Bideford 46	Exeter and St Thomas 247, Newton Abbot 57, Totnes 146
Cornwall	24	·06	21			
Somerset	21	·04	68			
Gloucestershire	260	·6	39		Bristol 76, Clifton 92, Gloucester 48	
Herefordshire	1	·01	2			
Shropshire	13	·05	17			
Staffordshire	426	·6	30		Dudley 256, Wolverhampton 80	
Worcestershire	103	·4	36		Worcester 45	
Warwickshire	89	·2	15			
Leicestershire	14	·06	3			
Rutlandshire	9	·08	—			
Lincolnshire	134	·3	48		Great Grimsby 68	
Nottinghamshire	80	·3	12		Worksop 27, Nottingham 16	
Derbyshire	17	·06	20			
Cheshire	141	·3	391			Chester
Lancashire	1775	·8	2600	1·0	Liverpool 1084, W. Derby 206, Wigan 158	Liverpool and W. Derby 2122, Wigan 137
West Riding	470	·3	283		Sheffield 126, Dewsbury 66, Leeds 48	
East Riding	70	·3	54		Hull 27	
North Riding	84	·4	21		Whitby 33, Guisboro' 30	

	1854		1866		Principal centres in each county	
	Deaths	Rate per 1000	Deaths	Rate per 1000	1854	1866
Durham[1]		2·9	352	·6	Stockton, Auckland, Durham	
Northumberland[2]		5·7	224		Newcastle 1431, Gateshead 525, Tynemouth 203	
Cumberland	35	·2	32			
Westmoreland	1	·02	1			
Monmouth	18	·1	204			
South Wales	887	1·4	2033	2·9	Merthyr Tydvil 455, Cardiff 255, Neath 54, Brecon 54	Swansea 521, Neath 520, Llanelly 232, Merthyr Tydvil 229
North Wales	34	·08	256			

The London cholera of 1854, like that of 1832 and of 1849, fell most upon the southern (Southwark etc.), eastern and south-eastern parishes (Table, p. 858). But it fell somewhat unequally upon these; and for Southwark and Lambeth the water supply was seized upon as the thing that made the difference. There were two water companies in South London, the Lambeth company and the Southwark and Vauxhall company. The parish of Christ Church, Lambeth, chiefly supplied by the Lambeth company, had a death-rate from cholera in 1854 of only 0·43 per 1000 inhabitants; whereas the parish of St Saviour, supplied by the Southwark and Vauxhall company, had a death-rate of 2·27 per 1000. In 1849 there had been no such disparity between them, the death-rate of Christ Church being if anything the higher of the two. Now it happened that in the interval of the two epidemics of cholera the Lambeth company had removed their intake works from opposite Hungerford Market to Thames Ditton, whilst the Southwark and Vauxhall company still continued to draw their supply from the Thames near Vauxhall. Here was a fine instance of the logical method of difference. Farther, within the parish of Christ Church itself, it was sought to show that the cholera followed the lines of old water supplies, and did not follow the mains from Thames Ditton. After 1854 the Southwark and Vauxhall company also made their intake at Thames Ditton. According to the water-hypothesis of cholera, it is not surprising, as we shall duly find, that the whole of the South London parishes, which had been the chief seats of the cholera in 1832, 1849, and 1854, escaped in 1866 with a

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[1] More than half in the end of 1853.

[2] Nearly all in the end of 1853.

very slight visitation. Newcastle was another chosen instance of cholera distributed by the water mains; but, as we have seen, that was improbable. Another instance was Exeter: its water supply in 1832, when part of it had a disastrous epidemic of cholera, was taken from the Exe, and was impure; in 1849, when it had only a tenth part of its last cholera mortality, its water supply had been greatly improved; in 1854 it had 10 deaths; but in 1866, Exeter with the registration district of St Thomas had 247 deaths, and Totnes had 146,—for their size about the most severely visited towns in England.

In the London cholera of 1854 a very sudden and simultaneous explosion in the district of Soho attracted much notice[1]. The district stands high, which did not save it from being the scene of the first outbreak in the great plague of 1665. In the subdistricts of St Anne, Golden Square and Berwick Street, with a population of 42,000, many of them well-to-do families, there were 537 deaths from cholera, a rate of 12·8 per 1000, contrasting with the rate of 6 per 1000 for all London. The attacks and fatalities were remarkably numerous for one or two days, falling at once thereafter to about a half. There was a pump in Broad Street, in the centre of this district, which was supposed to have dispersed cholera broadcast in its contaminated water; a death had occurred in Swain's Lane, at the foot of Highgate Hill, of a person who had drank the water of the Broad Street pump. The whole incident was seized upon and worked up by Dr Snow, who had written a speculative essay in 1849 upon the probability of cholera being conveyed by water, according to the similar theory of Parkin in 1832[2]. The Board of Health, having very full data before them of the Soho outbreak in all its aspects (including a whole biological treatise upon the organisms found in water), did not adopt Snow's conclusion, although he had enthusiastic followers at the time, and has probably more now[3]:

> "In explanation of the remarkable intensity of this outbreak within very definite limits, it has been suggested by Dr Snow that the real cause of whatever was peculiar in the case lay in the general use of one particular well, situate at Broad Street in the middle of the district, and having (it was

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[1] It was reported on by three commissioners, Dr Donald Fraser and Messrs Thomas Hughes and J. M. Ludlow, in the *Report of the Committee for Scientific Inquiries, Cholera Epidemic of* 1854. Appendix.

[2] John Snow, M.D., *On the mode of communication of Cholera*. London, 1849, 2nd ed. 1855.

[3] *General Board of Health, Report on Scientific Inquiries*, 1854, p. 52.

imagined) its waters contaminated by the rice-water evacuations of cholera patients. After careful inquiry we see no reason to adopt this belief. We do not find it established that the water was contaminated in the manner alleged; nor is there before us any sufficient evidence to show whether inhabitants of the district, drinking from that well, suffered in proportion more than other inhabitants of the district who drank from other sources."

The Cholera of 1853–54 in Scotland and Ireland.

The cholera of 1853–54 in Scotland has not been so fully recorded as either of the two preceding epidemics. It is said to have caused about six thousand deaths, of which 3892 were in Glasgow alone, and a considerable part of the remainder in Edinburgh and Dundee. The infection began to appear in the end of September, having been derived probably from the dreadful explosion at Newcastle. A few early cases occurred at Dunse, in Berwickshire. On the 16th September, 1853, the old Cholera Hospital at Edinburgh, in Surgeons' Square, was opened, but received only 45 cases until the beginning of June, 1854, when it was closed. In the autumn of 1854 the real epidemic began, the hospital being re-opened on 24th August, from which date until the 30th November the admissions were 198. These hospital figures indicate for Edinburgh a milder epidemic than that of the winter of 1848, which was itself milder than that of 1832. The cases came mostly from the very same localities of the old town as in 1848. There were 145 females to 97 males; the deaths were 117 in 243 cases admitted[1].

The epidemic at Dundee was a late autumnal or winter one, in the end of 1853, and of great severity, the mortality having probably exceeded 500. The Glasgow epidemic had a course very nearly parallel to that of 1832, and quite unlike the extraordinary winter explosion of 1848–9. It began, indeed, in winter—about the 15th of December, 1853, and had caused 849 deaths to the 27th of February; there was a sharp rise of the [illegible]ity from the 13th to the 24th of March, the total deaths [illegible]t date being 1306. As in 1832, the infection appeared to die [illegible]ut in the late spring and early summer; but in June it revived and increased in virulence until August, after which it subsided gradually until November, the whole mortality having been 3892, or ·98 per cent. of the population, nearly the same ratio as in 1848–9, (1·06) and a lower ratio than in 1832 (1·4).

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[1] J. W. Begbie, *Ed. Med. and Surg. Journ.* April, 1855, p. 250.

The first part of the epidemic fell chiefly on the north and east of the city, the second part, in summer and autumn, was all over the city, as in 1832, and among all classes, as in the winter of 1848–49, but perhaps less disastrously in the best quarters of the city than the last had been. The cholera hospital received a comparatively small part of all the cases—600 of cholera, 253 of diarrhoea, the deaths being 306, or less than a tenth part of the whole mortality[1].

It is probable that the mortalities in Scotland on this occasion, besides those in Glasgow, Edinburgh and Dundee, were neither so general nor so great as in 1832. One remarkable outbreak happened at the village of Symington, in Ayrshire: in a population of 240 there were 110 attacks and 30 deaths: nearly all the cases were in houses on one side of the village street, which got their water from a public well; the houses on the other side, having private wells (and differing, doubtless, in other respects), were notably free from the infection[2].

The cholera of 1854 was unimportant in Ireland. Cases appeared among emigrants on board ships in Belfast Lough and at Queenstown in the end of 1853, but no diffusion took place until 1854, and then only to a moderate extent. It is supposed that some 1706 persons died of it in Ireland in that year, according to the retrospective figures of the census of 1861; but a good many deaths from "cholera" were returned for every year of the decennium, so that it is improbable that the whole 1706 in 1854 were of the true Asiatic type. Ulster had 895 of these, Leinster 453, Munster 324, and the whole of Connaught only 34[3].

The Cholera of 1865–66.

Asiatic cholera reached Europe by a new route in 1865—by the way of Egypt with the pilgrims returning from the Hâj at Mecca [illegible] the course of the autumn it appeared at Southampton and [illegible] 35 deaths from 24 September to 4 November. A

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[1] *Glas. Med. Journ.* N.S. II. 127; III. 116, 500; John Crawford, M.D., "Report of Cases in the Cholera Hosp." *ibid.* III. 48.

[2] W. Alexander, M.D., *Edin. Med. Journ.* II. 86. The *Edin. Med. Journ.* 1. July, 1855, p. 81, contains a few lines of abstract of a paper by W. T. Gairdner on the diffusion of cholera in the remote districts of Scotland. Information on the subject is invited, but it does not appear that any full account of the cholera of 1854 in Scotland was published. It is known to have been in Aberdeen.

[3] *Census of Ireland* 1861, Part III. vol. 2, p. 23.

strange extension from Southampton (or from Weymouth) took place to the village of Theydon Bois in Epping Forest, where nine deaths were traced to one house from 28 September to 31 October, unhappily including the death of a most estimable medical gentleman who tasted the water of a well into which the evacuations of the sick had probably percolated.

The cholera having become established on the continent of Europe in the end of 1865, was brought into England by emigrants passing from Hull and Grimsby to Liverpool on their way to America. On board one of the emigrant steamships, the 'England,' a very severe epidemic arose in mid-Atlantic in April. Liverpool had once more a severe epidemic (2122 deaths); but the only other important centres in England, besides London, were Swansea, Neath, Llanelly and Merthyr Tydvil, Chester and Northwich, a group of towns on the Exe in Devonshire, and Portsmouth with other places in Hampshire. Still, the deaths in all England made the large total of 14,378, no county excepting Rutland being absolutely free. That means that the infection, although widely diffused, now wanted the conditions favourable to its development and effectiveness; and that, again, seems to mean that a vast improvement had been made in the sewering of towns, in scavenging, and in all other matters of municipal police by which the soil of inhabited spots is preserved from saturation with excremental and other filth.

The interest of the cholera of 1866 centres in London, and chiefly in the fact that three-fourths of the deaths, to the number of 3696, took place in the eastern parishes, Whitechapel, Bethnal Green, Poplar, Stepney, Mile End, St George's in the East, and Greenwich. These had in former epidemics a fair share; but hitherto they had been surpassed by the Southwark parishes and others on the south of the Thames from Battersea to Rotherhithe, and nearly equalled by Shoreditch and the Liberties of th[illegible]ity. The comparative table of the four great choleras [illegible]ndon shows how remarkably the infection in 1866 had left its [illegible] principal seats, remaining, as if a residue, only in the East End, with death-rates comparable to those of 1849.

Comparative view of the Four Epidemics of Cholera in the several parishes of London[1].

	1832		1849		1854 (17 wks. end. 4 Nov.)		1866	
	Rate per 10,000	Deaths	Rate per 10,000	Deaths	Rate per 10,000	Deaths	Rate per 10,000	Deaths
Kensington	10	52	24	260	35	490	3·7	85
Chelsea	80	272	46	247	47	300	3·3	22
St George, Hanover Sq.	10	74	18	131	38	295	1·7	18
Westminster	50	450	68	437	60	423	6·2	43
St Martin in the Fields	—	—	37	91	24	58	4·2	10
St James, Westminster	—	—	16	57	152	485	3·5	13
Marylebone	30	355	17	261	16	347	3·0	54
Hampstead	—	—	·8	9	11	14	·8	2
Pancras	20	230	22	360	13	248	6·0	138
Islington	10	39	22	187	8	97	4·3	120
Hackney	2	8	25	139	11	73	10·6	103
St Giles	50	280	53	285	21	115	9·2	49
Strand	1	26	35	156	24	111	6·6	29
Holborn	10	46	35	161	5	25	5·2	22
Clerkenwell	10	65	19	121	9	59	7·0	45
St Luke	30	118	34	183	9	52	8·1	46
East City	50	605	45	182	23	85	15·7	59
West City			96	429	10	126	18·8	60
City			38	207	14	71	5·0	20
Shoreditch	10	57	76	789	20	237	10·7	139
Bethnal Green	50	345	90	789	20	192	60·4	611
Whitechapel	110	736	64	506	40	330	84·2	909
St George in the East	30	123	42	199	30	154	87·9	385
Stepney	50	358	47	501	32	388	107·6	559
Mile End Old Town	—	—	—	—	—	—	67·7	501
Poplar	40	101	71	313	38	208	90·8	837
St Saviour	120	1128	153	539	134	495	7·4	32
St Olave			181	349	162	315	8·5	21
Bermondsey	70	210	161	734	158	845	5·3	35
St George, Southwark	—	—	164	836	101	546	6·6	38
Newington	40	200	144	907	101	696	2·8	26
Lambeth	40	337	120	1618	63	941	6·5	114
Wandsworth	10	46	100	484	77	422	4·8	40
Camberwell	30	107	97	504	91	553	5·6	46
Rotherhithe	10	19	205	352	147	285	8·7	25
Greenwich	20	149	75	718	53	576	19·5	284
Lewisham	—	—	30	96	20	81	6·1	56
Stratford	—	—	—	—	—	—	77·6	—
West Ham	—	—	—	—	—	—	49·3	—
Leyton	—	—	—	—	—	—	13·1	—

There was [illegible] significant thing associated with the peculiar incidence of the cholera of 1866 upon the East End. The main drainage of London, consisting of a high level and a low level sewer on each side of the Thames, was commenced in 1859, and

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[1] Compiled from Grainger's report for 1849, the Registrar-General's Reports for 1854 and 1866, a table in *Lancet*, i. 1867, p. 125, and, for 1866, a table by Radcliffe, in *Rep. Med. Off. Priv. Council for* 1866, p. 339.

was formally opened on 4 April, 1865. The two levels on each side of the river made together a length of eighty-two miles; the cost, with pumping station, was £4,200,000. When the cholera of 1866 broke out, only one part of the system was incomplete and not yet in working, namely, the low level main drainage on the northern side, which served the whole of the cholera-stricken parishes from Aldgate to Bow. However, the official mind in this country has somehow become prejudiced against the well-known and usually accepted generalities of von Pettenkofer, which make more of a foul soil in the causation of miasmatic infections, than of contaminated surface water or contaminated water from reservoirs. Accordingly, the somewhat remarkable fact that the East End of London alone retained its old proclivity for choleraic infection was not joined to the fact of its being the only great division of the capital still unsewered, but to the fact that it was supplied by water taken in from the river Lea in Hertfordshire and (it was alleged) insufficiently filtered or otherwise purified at the Old Ford waterworks[1].

The extension to Scotland in 1866 was late in the season and insignificant compared with former epidemics. It was heard of about the end of summer in Fraserburgh and one or two other ports or fishing places on the East Coast, but it was not until October and November that it attracted notice in the eight principal towns, the whole mortality from it in Glasgow being 53, in Edinburgh 154, in Dundee 105, in Aberdeen 62, in Paisley 2, in Greenock 14, in Leith 95, and in Perth 15. Besides these deaths there were 435 more in smaller towns or villages. The year was a very healthy one, the death-rates of Glasgow, Greenock and Perth having been below the mean of the previous ten years.

In Ireland the cholera of 1866 was even slighter than in Scotland, the only considerable epidemic having been at Belfast.

Cholera has never obtained a footing in London since the epidemic of 1866. In 1873, while the disease was unusually active in some parts of Europe, a few cases occurred in Wapping among Scan[illegible]ian emigrants on their way to America, who had been la[illegible]d for a few days. But the infection did not spread. In 1884, when cholera came from Cochin China to Toulon and Marseilles, two or three cases occurred on board

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[1] Radcliffe, *Rep. Med. Off. Privy Council for* 1866, p. 294.

steamships arriving at Cardiff and Liverpool. In 1893, when the disease raged in Hamburg, a number of choleraic cases occurred at Grimsby in August, which were considered certainly Asiatic owing to their high degree of fatality. In August–October, the deaths from cholera, whether cholera nostras or the Asiatic type, or both together, were about thirty in Grimsby, eighteen in Hull, and about fifty more in various other places, chiefly in the south of Yorkshire. The autumn of that year was favourable to bowel-complaints and to enteric fever.

The Antecedents of Epidemic Cholera in India.

The antecedents and circumstances that made the year 1817 so critical for cholera in India, and for its diffusiveness far beyond India, constitute one of the greatest problems in epidemiology. A full and minute examination of them cannot be attempted here; but the chapter would be incomplete without some statement on the subject, which, if summary, need not be dogmatic. Cholera with the same symptoms and a similar degree of fatality was certainly not new to India about the year 1817; it can be traced from the earliest records of the Portuguese and other Europeans in India, if not also in other countries in ancient times[1]. The mortalities among troops during the military operations in the Northern Circars in 1781 and 1790, and the deaths of some 20,000 pilgrims in eight days during the Hurdwar festival of 1783, were undoubtedly from the same epidemic infective cholera that was seen fifty years after in Europe. But these were occasional great explosions, which arose suddenly and ceased abruptly; whereas from about 1817 onwards the infection became, as it were, a seasonal product of the soil of Lower Bengal year after year, and at the same time began to range widely beyond its "endemic area" to other provinces of India, beyond the North-Western frontier to Central Asia and to Europe, and across the ocean to America. It was not by any sudden change in the year 1817, we may be sure, that cholera began to be endemic at various places far apart in the valley of the Ganges. Th [illegible] must have been tending towards that

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[1] Scoutetten, *Histoire médicale et topographique du Cholera Morbus*, Metz, 1831; and *Histoire chronologique du Cholera*, Paris, 1870. David Craigie, M.D., "Remarks on the History and Etiology of Cholera." *Edin. Med. and Surg. Journ.* xxxix. (1833), 332. John Macpherson, M.D., *Annals of Cholera*, London, 1872 and 1884. N. C. Macnamara, *A History of Asiatic Cholera*, London, 1876.

manifestation for some time before, and those things must have been of the same kind that made the great explosion at Hurdwar in 1783 and have made many other great explosions at the Indian religious festivals in later times. Briefly the opinion may be hazarded, that it was the permeation with excremental matters of the soil at large in and around Bengali villages that gave rise to the endemic miasmatic infection of cholera. The *odor stercoreus* of those innumerable village communities is, or used to be, a familiar fact, just as it is well known to be the custom there to dispense with latrines or other systematic provision for the disposal of faecal matters. But it may seem improbable that personal habits of the peasantry, not unknown in other countries, and immemorial in Lower Bengal itself, should have led to a definite disease-effect in a certain year of the 19th century and perennially thereafter. As to the special risk of engendering such a soil-poison in the valley of the Ganges, it has to be said that the region is peculiar in its alternations from extreme saturation to extreme dryness, within a stratum of alluvial or other porous soil which has a bed of impervious blue clay beneath it at a depth seldom more than 10 feet. It is just where such extreme fluctuations of the ground-water within a limited range occur from season to season, that organic matters in the soil are most apt to develop a miasmatic infective property. But why should the year 1817 have been, by the general consent of Anglo-Indian observers, the beginning of a new era in the history of cholera? The guiding principle in all such cases is, that things must have been moving that way before, and that in the particular season there had been reached at length such a degree of aggravation as to make a specific result manifest or the cumulative causes effective. Two things may be indicated as relevant to this assumed aggravation, or integration of accumulating causes. One was a certain gradual change in the beds of rivers, especially in the province of Behar, which entirely altered the relative amount of water flowing above ground and under ground, and must have made a difference in kind and in degree to the decomposition-processes in the soil. (In Burdwan these changes in the ground-water have caused much miasmatic fever since about thirty years ago.) The other thing was the increase of the number of cultivators per square mile under British rule. The latter cannot be stated with even approximate exactness for periods before the census of 1872; but there can be no reason-

able doubt that the increase was great and progressive from the end of last century, owing to the cessation of intertribal wars, and of famines which were chiefly caused by the overflow of rivers now no longer subject to floods, and of wilful and barbarous checks to population. Among the cholera localities of 1817 were some that have now the greatest pressure of inhabitants on the soil, not in cities, but in uniformly dispersed rural communities—such as the division of Patna with 637 inhabitants per square mile, the district of Jessore with 693, and of Dacca with 756. This is of course a very general account of the matter, which a minute study of localities and seasons might show to be highly inadequate; but in seeking for some circumstances of aggravation at the particular juncture, the two things that have been mentioned, both of them coincident historical matters of fact, will appear to be not irrelevant according to the received teaching on the favouring conditions of cholera.

NOTE ON CEREBRO-SPINAL FEVER.

British experience, or the records of it, afford so little material for the history of epidemic cerebro-spinal fever (very abundant for France, Germany and the United States of America, see Hirsch, III. 547) that it has not seemed desirable to interpolate the subject in the chapter on Typhus and other Continued Fevers. Although our experience of it has fallen perhaps wholly within the period of exact statistics of the causes of death (saving some doubtful identifications in the 18th century), yet the registration tables contain so few deaths from it that it hardly seems as if a new and remarkable type of fever of the typhus kind had really been in our midst. There are, however, two periods when a good many papers were written upon it in Ireland and England, the years 1865–67 and the year 1876. When the first cases were seen in London in 1865 Murchison pronounced the new fever to be closely allied to typhus (*Lancet*, 1865, p. 1417). At the same time in Ireland it was sometimes called "the black death," from the dark or livid vibices of the skin, or purpura maligna, or purpuric fever (J. T. Banks, *Dubl. Quart. Journ. Med. Sc.* XLIII. 98; E. W. Collins, *ibid.* XLVI. 170; Cogan, *ibid.* XLIV. 172; Gordon, *ibid.* XLIV. 408; H. Wilson, *ibid.* XLIII.; Haverty, *ibid.*; T. W. Belcher, *Med. Press*, N. S. III. 167; J. H. Benson, *ibid.* III. 387; editor, *ibid.* 506. For England, S. Wilks, *Lancet*, 1865, I. 388, *Brit. Med. Journ.* 1868, I. 427; F. J. Brown, *Trans. Epid. Soc.* II. (1865), 391; J. N. Radcliffe in Reynolds' *System of Medicine*, 1st ed. II. 676; H. Day, *Lancet*, 1867, I. 731). In the second period, 1876, there were many cases in England, especially in the Midlands, but it is said that they were usually diagnosed as typhoid fever (Sir Walter Foster, *Brit. Med. Journ.* 1892, II. 278, and *Lancet*, 1876, I. 849; Neville Hart (for Birmingham), *St Barth. Hosp. Rep.* XII. (1876), 105; H. Thompson, *Lancet*, 1876, I. 849. The Irish papers in the second period are by T. W. Grimshaw, *Dub. Journ. Med. Sc.* LXI. 520, and LVII. 375; E. H. Bennett, *ibid.* LIX.; Brabazon, *Brit. Med. Journ.* 1876, I. 509). An epidemic of cerebro-spinal fever, resembling typhoid, was described for a Shropshire village in May, 1891 (Monk, *Brit. Med. Journ.* 1892, II. 278). A case which came under my notice on 19 March, 1894, in an eastern parish of London, has led me to doubt whether the half-dozen or so of deaths annually certified in London as from cerebro-spinal fever (contrasting with as many hundreds in New York), are of the slightest statistical value.

A young woman, aged 16, an artificial flower maker, became ill with pains in the limbs and was taken as an out-patient to a hospital. Thereafter she became light-headed. A private practitioner (M.R.C.S.) was called in, who found her with a temperature of 103°, excited, and inclined to clutch spasmodically at his arms; her coarse black hair was full of pediculi and nits. She died next day, having had sent her by the practitioner a draught of chlorodyne on account of her extreme restlessness. An inquest was appointed, and the practitioner ordered to make a post-mortem examination. He attended the inquest and gave evidence that death was due to "congestion of the brain." The jury were dissatisfied, and the coroner adjourned the inquest for a second examination by a skilled pathologist.

After spending two hours looking for the cause of death (there was no congestion of the brain), I discovered that the base of the brain had been left in the skull intact, the hemispheres having been sliced off by a horizontal section in the plane of the saw-draught round the cranium. On raising the frontal lobes I saw green flaky lymph lying on the orbital plates and on the corresponding surfaces of the arachnoid ; the same was found on the optic commissure, the surface of the pons, the medulla and over a small area of the under convexities of the lateral lobes of the cerebellum, where it amounted to little more than whitish opacity. The lymph was purely basal, solely on the arachnoid, not in the fissures or sulci. The examination having already lasted over two hours, it was found impracticable to expose the spinal cord. The facts previously found were : an extensive blood-shot state of the left conjunctiva with oedema of the upper lid (there was no obvious intra-orbital disease) ; round dusky-red spots on the outer sides of the thighs and on the shoulders ; both lungs in a state of solid purple congestion at the bases, crepitant at the apices, the costal pleura dark red or livid ; the tongue large and flabby, congested around the broad papillae ; the stomach at the cardiac end, exactly corresponding to the pressure of a mass of hard undigested food, dotted with numerous small round ecchymoses under the serosa ; six inches of the lower end of the jejunum, corresponding to a mass of hard impacted faeces, dotted with the same subserous ecchymoses ; a narrow belt of deep congestion round the broad ends of the kidney pyramids ; the mucosa of the fundus uteri haemorrhagic. There was no herpetic eruption. At the adjourned inquest the cause of death was found to be cerebro-spinal fever, and was so certified by the coroner to the Registrar-General. The practitioner who attended the deceased was unable to say whether the most distinctive of all the symptoms, the violent retraction of the occiput upon the shoulders, was present or absent. It is improbable that this was a solitary case of epidemic cerebro-spinal meningitis in the East End of London in the spring of 1894, (the early spring being the distinctive season of the infection). Even if it were the only case, it narrowly missed being returned as a death from "congestion of the brain," and that, too, after post-mortem inquisition. The practitioner's statutory fees were three guineas. There has lately been collected much evidence upon certificates of death, and upon diagnosis under the Notification Act, which makes it doubtful whether our mortality statistics are as correct in substance as they are methodical and exhaustive in form.

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